PAGE'S WEEKLY.—July 28, 1905. Thin Paper Copy for Circulation Abroad.

No. 46. Vol. 7.

SIXPENCE.
(Registered as a Newspaper.)

FRIDAY,
JULY 28, 1905.

PAGE'S WEEKLY

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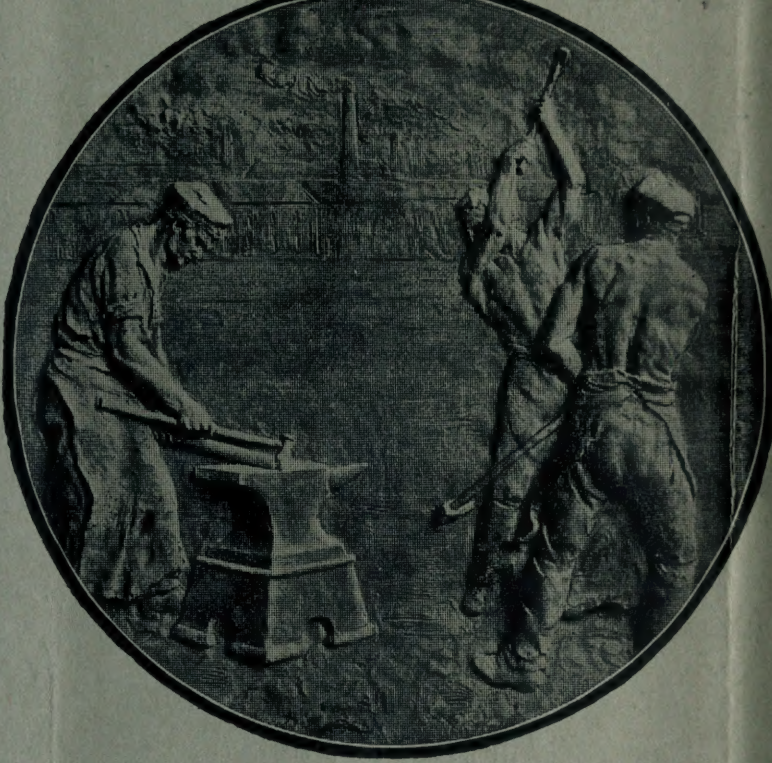

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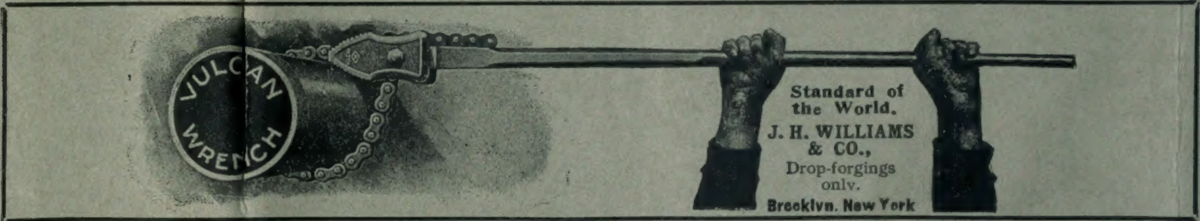

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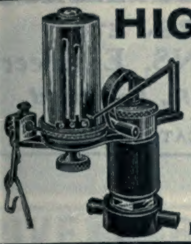
PAGE'S WEEKLY Miscellaneous

Mr. G. H. HUGHES, M.I.Mech.E.,
Consulting and Organising Engineer for Water Works and Industrial Undertakings,
97, QUEEN VICTORIA ST., LONDON, E.C.
Telephone No.: 5754 Bank. Write for particulars.

McINNE'S PATTERN.



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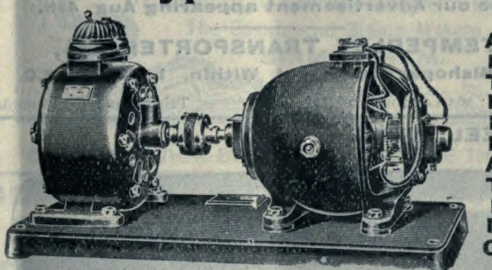
Hannan & Buchanan,
75, Robertson Street, Glasgow.
ENGINE COUNTERS.
BOURDON GAUGES.
On Admiralty List.
Engineering Instrument Makers

Why build High Towers and Elevated Water Tanks?
I can store water UNDER PRESSURE in ANY POSITION, and deliver it to ANY ELEVATION at any DESIRED PRESSURE.
Catalogues on application.
ERIC S. A. SMITH,
BRIDLINGTON.

The Crypto Electrical Co.



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GRAHAM, MORTON & Co., LTD.
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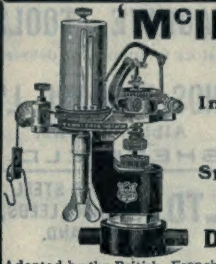
Makers and Erectors of all Classes of
CONVEYING PLANTS, COAL HANDLING PLANTS, AERIAL ROPEWAYS, &c., &c.

PAGE & ROWLINGSON,
Chartered Patent Agents.
Mr. Page, who is a Whitworth Exhibitioner and an Associate Member of the Institute of Civil Engineers, has had a large experience as a Practical Mechanical Engineer, and is specially qualified to deal with the most intricate mechanical problems successfully. *Write for Handbook of Information Free.*
28, NEW BRIDGE STREET, LONDON, E.C.,
And 14, St. Ann's Square, Manchester.



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Each made in several forms and sizes to suit all speeds and pressures.
Special Indicators for Gas, Winding, and Ammonia Engines, and for Motor-Cars.
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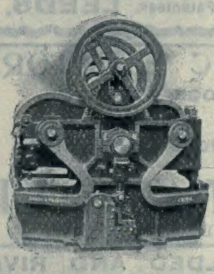

PUNCHING & SHEARING Machines.
STEAM HAMMERS.
Shipbuilders' MACHINE TOOLS.
DAVIS & PRIMROSE,
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BABCOCK & WILCOX, Ltd.
PATENT WATER-TUBE BOILERS.
These Boilers are in use throughout the world to the extent of 4,700,000 h.p. generating steam for all purposes, and fired with all kinds of fuel.
See our Advertisement appearing Aug. 4th, page 37.
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PAGE'S WEEKLY Miscellaneous

THE BRITISH ADVERTISER SERVICE BUREAU,
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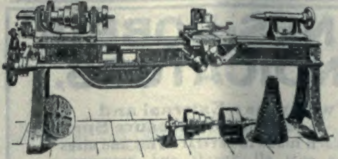
Specialises in Advertising for Engineers.
CAN IT ASSIST YOU?



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Rolled Steel Joists, Channels, etc.
Mild Steel Blooms, Billets, Slabs, Tinbars, Rounds and Flats.
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FOR ALL SERVICES.
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Samples, Lists, and Testimonials on application
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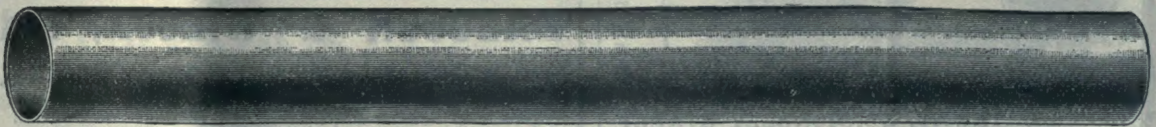
Tested to 350 lb. Steam Pressure.
For High Pressure Boilers.

STONE BREAKERS,
GRAVEL WASHERS, ETC.
SAMUEL PEGG & SONS, Engineers,
LEICESTER, England.
SEND FOR ILLUSTRATED CATALOGUE.

TRANSPORTERS.
See our Advertisement appearing Aug. 4th.
TEMPERLEY TRANSPORTER CO.,
72, Bishopsgate Street Within, LONDON, E.C.
Telephone: 365 London Wall. Telegrams: "Transumo."

WELDED AND RIVETED STEEL PIPES.



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Situated on Pascagoula Bay and on the line of the Louisville and Nashville Railroad. These works have been in operation for more than twenty-six years. ORDERS for Creosoted Piles, Telegraph Poles, Cross Arms, Electric Conduits, Paving Blocks, Sawed Tiles, and Timber PROMPTLY EXECUTED. New cylinders, 115 ft. long. Capacity, one million feet per month. A.B.C. Code used. Cable address: Pierre, West Pascagoula, Miss.—Address, JNO. B. LINDSEY, Superintendent.

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RECORDERS.
For further particulars . . of our . . TIME RECORDERS
see our whole page Ad. on Aug. 4th.
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PAGE'S WEEKLY Miscellaneous

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Blue Planished and Glazed Steel Sheets for Lagging
and Covering generally.

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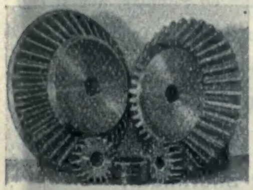

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Also all kinds of Metal Gearing.
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Write for particulars to:—

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GAS ENGINES & SUCTION PLANTS,
OIL ENGINES & PUMPS.
SOLE MAKERS—
THE CAMPBELL GAS ENGINE CO.,
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London Office— 114, Tooley Street, S.E.
Glasgow Office— 104, Bath Street.

BERTRAMS, Ltd.,
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MACHINE TOOLS.
See Next Week.

EDGAR ALLEN & CO.,
Limited,
Sheffield.

LATEST TYPES
OF
POINTS AND CROSSINGS
FOR TRAMWAY WORK.

PAGE'S WEEKLY Contracts

CONTRACTS.

MERTHYR TYDFIL URBAN DISTRICT COUNCIL.

REFUSE DESTRUCTOR PLANT.

The Council invite **TENDERS** from experienced makers of Refuse Destructor Plant for the **ERECTION** of **PLANT** capable of effectually burning 120 tons of refuse per day, together with all buildings and contingent works connected therewith.

The Council have selected three alternative sites, and copies of the site plans, together with "General Conditions and Particulars for the guidance of Contractors tendering," may be obtained upon application to T. FLETCHER HARVEY, Esq., Engineer and Surveyor to the Council, upon payment of a fee of £3 3s., which will be returned upon receipt of a *bona fide* Tender.

The Council do not bind themselves to accept the lowest or any Tender.

Sealed Tenders, endorsed "Destructor Plant," must be delivered to T. Aneuryn Rees, Esq., Clerk to the Council, on or before September 1st, 1905.

T. FLETCHER HARVEY,
Engineer and Surveyor to the Council.

Town Hall, Merthyr Tydfil,
June 16th, 1905.

MUNICIPAL BOARD OF MUSSOORIE, INDIA.

ELECTRIC LIGHTING AND WATER WORKS SCHEME.

The Municipal Board of Mussoorie, India, is prepared to receive

TENDERS FOR THE SUPPLY, DELIVERY, and ERECTION at sites, in complete working order, of the following plant :—

(*a*) Steel Power Pipes; (*b*) Water Motors; (*c*) Alternators with Exciters; (*d*) Switchboards with Instruments and Apparatus; (*e*) Transformers; (*f*) Induction Motors; (*g*) Pumps; (*h*) Workshop Machines.

Also for the **SUPPLY** and **DELIVERY** of the following :—

(*a*) Bare Copper Wire for Overhead Mains; (*b*) Insulators and Lightning Arresters; (*c*) Arc and Incandescent Lamps; (*d*) Telephone Equipment; (*e*) Workshop Tools; (*f*) General Stores.

Specifications, Form of Tender, and General Conditions can be obtained on application to the undersigned on payment of a deposit of Rs. 75 (£5), which amount will be returned on receipt of a *bona fide* Tender. Additional copies may be obtained on payment of a further fee of Rs. 5 (6s. 8d.) per set, which will not be returned.

The Firm whose Tender is accepted will be required to find two sureties to the satisfaction of the Municipality, and to enter with them into a contract to be prepared by the Municipality, and to contain such clauses as it may think necessary.

Sealed Tenders, on the prescribed form, endorsed "Tender for Electric Lighting and Water Works Scheme," should be addressed to the Chairman, Municipal Board, Mussoorie, India, and must be delivered to him on or before Monday, October 23rd, 1905.

The Municipality does not bind itself to accept the lowest or any Tender, nor will it consider any Tender that is not for the whole of the Plant and Material.

By order,
C. H. SHANAN,
Assoc. M.Inst.C.E., A.M.I.E.E., A.M.I.Mech.E.,
Municipal Electrical Engineer.

Municipal Office, Mussoorie, U.P., India,
June 14th, 1905.
Telegraphic Address: "Shanan, Mussoorie."

COUNTY BOROUGH OF WOLVERHAMPTON.

TETTENHALL PUMPING STATION EXTENSIONS.
CONTRACT No. 2.

The Corporation of Wolverhampton are prepared to receive **TENDERS** for a **VERTICAL TRIPLE-EXPANSION PUMPING ENGINE** and **OTHER WORK** connected therewith from engine builders who will undertake to pay the rate of wages and observe the hours of labour recognised and agreed upon between the Trades Unions and the Employers respectively in the locality in which the work is to be performed, or such a rate of wages or hours as are equivalent or approximate thereto.

A copy of the Specification and Form of Tender may be obtained from Mr. E. A. B. WOODWARD, Waterworks Engineer, Town Hall, Wolverhampton, upon payment of the sum of Five Pounds, which amount will be returned to every engine builder who submits a *bona fide* Tender, but not otherwise.

Each Tender must be enclosed in a sealed cover addressed to "The Chairman of the Water Committee," and endorsed "Pumping Machinery," and delivered at my office on or before Friday, the 1st day of September next.

The right to decline the lowest or any Tender is reserved to the Corporation.

HORATIO BREVITT,
Town Clerk,

Town Hall, Wolverhampton,
July 4th, 1905.

BISHOP'S STORTFORD URBAN DISTRICT COUNCIL.

SEWAGE WORKS.—CONTRACT No. 1.

Subject to the sanction of the Local Government Board being obtained to the necessary loans, the Council invite **TENDERS** for :—

Supplying and Fixing Gas Pumping Engine, Suction Gas Plant, and Sewage Pumps at their Sewage Pumping Station.

Specification and Form of Tender can be obtained on application to the undersigned.

The person or firm whose Tender is accepted will be required to enter into a written contract, and to provide two eligible sureties.

Sealed Tenders, endorsed "Tender for Pumping Engine," to be sent to me, the undersigned, by 4 o'clock p.m. on Saturday, August 12th, 1905.

The Council do not bind themselves to accept any Tender.

By order,
THOS. SWATHERIDGE,
Clerk to the Council.

Council Offices, 7, North Street, Bishop's Stortford,
July 14th, 1905.

COUNTY BOROUGH OF BURY.

TO REFRIGERATION ENGINEERS.

The Corporation of Bury are prepared to receive **SCHEMES** and **TENDERS** for the **ALTERATIONS** required in connection with their **ICE-MAKING PLANT** and **COLD STORES** at the Abattoirs, Bury.

Conditions, Specifications, and Forms of Tender may be obtained from Mr. ARTHUR W. BRADLEY, Assoc.Mem.Inst.C.E., Borough Engineer and Surveyor.

Sealed Tenders, endorsed "Ice Plant," and addressed Chairman, Abattoirs Sub-Committee, must be delivered at my office not later than the 19th day of August next.

JOHN HASLAM,
Town Clerk.

Municipal Offices,
Bank Street, Bury,
July 6th, 1905.

PARISH OF IPSWICH.

STEAM BOILER.

The Guardians of the Parish of Ipswich are prepared to receive

TENDERS FOR THE SUPPLY AND ERECTION of a Cornish-Type **BOILER**, which is to have a heating surface of approximately 400 square feet.

Specifications, fully describing the Boiler required, may be obtained upon application to the undersigned, such application must be accompanied by a cheque for Two Guineas, which will be returned upon receipt of a *bonâ fide* Tender. Any technical information regarding the boiler may afterwards be obtained from the Consulting Engineer to the Guardians, E. MCGREGOR DUNCAN, Esq., 27, Old Queen Street, Westminster, London.

Tenders are to be delivered at these Offices before Ten o'clock in the morning of Saturday, August 5th, 1905.

By order of the Board,
RICHARD J. KENT,
Clerk to the Guardians.

Guardians' Offices, 19, Tower Street, Ipswich,
July 14th, 1905.

MUNICIPAL BOARD OF MUSSOORIE, INDIA.

WATER WORKS SCHEME.

The Municipal Board of Mussoorie, India, is prepared to receive

TENDERS FOR THE SUPPLY AND DELIVERY of the following :—

(*a*) Pipes; (*b*) Tees; (*c*) Cross Pieces; (*d*) Reducers; (*e*) Bends; (*f*) Bends and Collars; (*g*) Sluice Valves and Stop Cocks; (*h*) Ball and Non-return Valves.

Specifications and Form of Tender can be obtained on application to the undersigned, on payment of a deposit of Rs. 45 (£3), which amount will be returned on receipt of a *bonâ fide* Tender. Additional copies may be obtained on payment of a further fee of Rs. 3 (4s.) each, which will not be returned.

The firm whose Tender is accepted will be required to deposit the sum of Rs. 1500 (£100) in a bank, and the receipt, endorsed in favour of the Chairman, must be forwarded with the Tender. This amount will be forfeited on the failure of the Tenderer to execute a formal contract bond within two months of the acceptance of his Tender.

Sealed Tenders, on the prescribed form, endorsed "Tender for Water Works Scheme," should be addressed to the Chairman, Municipal Board, Mussoorie, India, and must be delivered to him on or before Monday, October 9th, 1905.

The Municipality does not bind itself to accept the lowest or any Tender.

By order,
C. H. SHANAN,
Assoc.M.Inst.C.E., A.M.I.E.E., A.M.I.Mech.E.,
Municipal Electrical Engineer.

Municipal Office, Mussoorie, U.P., India,
June 14th, 1905.
Telegraphic Address: "Shanan, Mussoorie."

PAGE'S WEEKLY Contracts and Appointments Open

EAST INDIAN RAILWAY.—THE EAST

INDIAN RAILWAY COMPANY is prepared to receive TENDERS for the SUPPLY and DELIVERY of :—

COAL WAGONS, COVERED WAGONS and BRAKE VANS, as per specification to be seen at the Company's offices.

Tenders are to be sent to the undersigned, marked "Tender for Wagons and Brake Vans," not later than Twelve o'clock noon on Wednesday, the 2nd day of August proximo.

The Company reserves to itself the right to divide the order, also to decline any Tender without assigning a reason, and does not bind itself to accept the lowest or any Tender.

For each specification a fee of £1 1s. is charged, which cannot under any circumstances be returned.

By order,
C. W. YOUNG,
Secretary.

Nicholas Lane, London, E.C.,
July 20th, 1905.

FLEETWOOD SEWERAGE WORKS, 1905.

CONTRACT No. 2.

The Fleetwood Urban District Council are prepared to receive TENDERS from competent persons for the SUPPLY and ERECTION of town's GAS ENGINES and VERTICAL TREBLE-RAM PUMPS, in duplicate, capable of delivering 260 cubic feet of sewage per minute through a total lift of 27½ ft., including friction. Also for the SUPPLY and ERECTION of town's GAS ENGINES and CENTRIFUGAL PUMPS, in duplicate, capable of delivering 620 cubic feet of sewage per minute, through a total lift of 21¼ ft., together with Starting Apparatus, Water Tank, Travelling Crane, Workshop Fittings, and other appliances and connections.

The Council are further prepared to receive, as alternative to the above-described machinery, TENDERS for the SUPPLY and ERECTION of PRODUCER GAS PLANT, PRODUCER GAS ENGINES, VERTICAL TREBLE-RAM PUMPS and CENTRIFUGAL PUMPS, all in duplicate, capable of performing the aforesaid duties, together with all the appurtenances above referred to.

Plans and sections of the proposed works may be seen, and specifications and bills of particulars, together with forms of Tender, may be obtained on application to GEO. R. STRACHAN, Esq., M.Inst.C.E., 9, Victoria Street, Westminster, London, on and after Monday, 24th inst., on payment of a deposit of Three Guineas by cheque, which will be returned on receipt of a *bonâ fide* Tender.

Sealed Tenders, endorsed "Tender for Sewage Pumping Machinery," are to be delivered to me at my office in Fleetwood at or before 10 o'clock a.m. on Thursday, August 10th, 1905.

The lowest or any Tender will not necessarily be accepted.

By order,
JOSEPH TILDESLEY,
Clerk and Accountant.

Town Hall, Fleetwood,
July 19th, 1905.

ABERDEEN HARBOUR.—DOCK RAILWAYS.

The Aberdeen Harbour Commissioners are prepared to receive TENDERS for the SUPPLY, DELIVERY, and FITTING UP COMPLETE of MANGANESE STEEL POINTS and CROSSINGS, and SPECIAL TRACK WORK, required for Dock Railway Layouts.

Copies of the Specification, Schedule of Quantities, and the Contract Drawings, may be obtained from the undersigned on payment of Two Guineas, which will be returned in due course to *bona fide* Offerers who return all the documents issued.

Tenders, endorsed "Tender for Special Track Work," are to be lodged with the undersigned not later 12 o'clock noon on Monday, July 31st, 1905.

R. GORDON NICOL,
Engineer.

Harbour Engineer's Office, Aberdeen,
July 14th, 1905.

THE BENGAL AND NORTH-WESTERN RAILWAY CO., LTD.

The Directors are prepared to receive

TENDERS FOR THE SUPPLY OF :—

125 tons of WROUGHT IRON.

Specification, with form of Tender and Company's General Conditions of Contract, may be obtained from the Company's offices on payment of a fee of 10s. (which will not be returned).

Tenders to be delivered in sealed envelopes, addressed to the undersigned, and marked on the outside "Tender for Wrought Iron," and lodged not later than noon on Monday, the 31st day of July, 1905.

The Directors do not bind themselves to accept the lowest or any Tender.

By order of the Board,
A. IZAT,
Managing Director.

Company's Offices,
237, Gresham House, Old Broad Street,
London, E.C., July 20th, 1905.

APPOINTMENTS OPEN.

CITY AND COUNTY OF NEWCASTLE-UPON-TYNE.

APPOINTMENT OF CITY ENGINEER AND TOWN SURVEYOR.

The CORPORATION of Newcastle-upon-Tyne are prepared to receive applications for the appointment of CITY ENGINEER and TOWN SURVEYOR. The gentleman appointed will be required to devote the whole of his time to the duties of his office, and not to undertake, or engage in, any other employment. Salary, £800 per annum, rising £100 per annum to £1,000 per annum. Duties to commence on November 11th, 1905, or such subsequent date as may be arranged.

Candidates for the appointment are requested to send their applications, stating their age (which must not exceed fifty years), qualifications, and experience, and enclosing copies of not exceeding three testimonials of recent date, addressed "Town Clerk, Town Hall, Newcastle-upon-Tyne," and endorsed "Appointment of City Engineer," not later than August 5th, 1905, after which no application will be received.

Canvassing will be considered a disqualification.

HILL MOTUM,
Town Clerk.

Town Hall, Newcastle-upon-Tyne,
July 7th, 1905.

BURMA RAILWAYS COMPANY, LIMITED.

ASSISTANT ENGINEERS.

The Directors are prepared to receive

APPLICATIONS (BY LETTER ONLY)

for three APPOINTMENTS as TEMPORARY ASSISTANT ENGINEERS in the Way and Works Department in Burma.

Applicants should be between 22 and 30 years of age, and have had at least three years' scientific education at a recognised engineering college, and thereafter a year's experience in practical work.

Salary : Up to Rs. 400 per mensem, according to qualifications, with exchange compensation allowance in addition.

Terms : Two years' agreement, with three months' notice, and free first-class passages to Burma. The Company will also provide the selected candidates with first-class passages back to England on the termination of their services, unless such service shall be terminated for misconduct.

The Applicants selected will be required to pass a medical examination by the Company's consulting physician before appointment

Letters of application, marked "Assistant Engineer," with copies (not originals) of testimonials, accompanied by a medical certificate of fitness for residence in India, should be addressed to the undersigned not later than August 10th, 1905.

Specimen Forms of Agreement may be obtained on application, personally or by letter, at the London Office,

(Signed) A. G. BEGBIE,
Managing Director.

Office,
76, Gresham House, Old Broad Street, London, E.C.,
July 19th, 1905.

CITY OF LEEDS.

THE CORPORATION INVITE APPLICATIONS

from COMPETENT PERSONS for the POSITION of CITY ENGINEER. Salary, £600 per annum.

A list of the duties of the Office may be obtained from the undersigned, to whom applications, with copies of three recent testimonials, and endorsed "City Engineer," are to be sent not later than the 31st inst.

Canvassing members of the Council, directly or indirectly, will disqualify candidates.

Town Hall, Leeds, July 1905. ROBERT E. FOX, Town Clerk.

MUNICIPALITY OF CAWNPORE, INDIA.

WANTED, an ASSISTANT MUNICIPAL ENGINEER.

Candidates should have been regularly trained as Civil Engineers, and have had experience in Municipal Engineering Works, particularly in sewerage and water works. Age not to exceed 30 years. Salary Rs. 375 a month, including all allowances, rising to Rs. 500 a month by annual increments of Rs. 25 a month for four years, and Rs. 50 a month the fifth year. An agreement for five years to be entered into.

Second-class passage by P. & O. steamer to Bombay, and first-class railway fare from Bombay to Cawnpore will be paid by the Municipality.

Salary to commence from date of steamer leaving London.

Applications, stating age and experience, with testimonials, to be sent in not later than Monday, July 31st, addressed to—

Mr. FRANK E. PRIEST, M.Inst.C.E.
13, Harrington Street, Liverpool, July 10th, 1905.

WANTED, EXPERIENCED SALESMAN

having connection with Engineers and large manufacturing establishments in the Midlands and London district. Must be familiar with tools and general machinery. Address, B. 6, c/o Judds' Advertising Offices, 5, Queen Victoria Street, London, E.C.

BUYERS' DIRECTORY.

NOTE.—*The display advertisements of the firms mentioned under each heading can be found readily by reference to the Alphabetical Index to Advertisers on pages 23 and 25.*

In order to assure fair treatment to advertisers, each firm is indexed under its leading speciality ONLY.

Advertisers who prefer, however, to be entered under two or more different sections can do so by an annual payment of 5s. for each additional section.

Advertisers' Service Bureau.
British Advertiser Service Bureau, Queen Anne's Chambers, Westminster, S.W.

Artesian Well Machinery.
John Z. Thom, Patricroft, Manchester.

Belting.
Binney & Son, Catherine Street, City Road, London, E.C.
Cort, Arthur, & Co., Camberwell, London, S.E.
Fleming, Birkby & Goodall, Ltd., West Grove, Halifax.
Gilmour, W. & O., St. John's Hill, Edinburgh.

Boilers.
Clayton, Son & Co., Ltd., Leeds City Boiler Works, Leeds.
Grantham Crank & Iron Co., Ltd., Grantham.

Boilers (Water-tube).
Babcock & Wilcox, Ltd., Oriel House, Farringdon Street, London, E.C.
Stirling Boiler Co., Ltd., Motherwell, N.B.

Bolts, Nuts, Rivets, etc.
Herbert W. Periam, Ltd., Floodgate Street Works, Birmingham.
T, D. Robinson & Co., Ltd., Derby.

Books.
Crosby Lockwood & Son, Stationers' Hall Court, London, E.C.
Griffin, Charles, & Co., Exeter Street, Strand, W.C.
New Zealand Mines Record, Wellington, New Zealand.
Spon, E. & F. N., 125, Strand, W.C.

Boring Machines.
Asquith, William, Ltd., Well Road Works, Halifax.
Niles-Bement-Pond Co., 23-25, Victoria Street, London, S.W.

Case-Hardening Compounds.
Hy. Miller & Co., Millgarth Works, Leeds.

Castings.
Ashmore, Benson, Pease & Co., Ltd., Stockton-on-Tees.

Catalogues, Printing, &c.
Atlantic Press, Ltd., Weymouth Street, Manchester.
Spottiswoode Advertising Agency, Clun House, Surrey Street, Strand, W.C.
Stafford, Arthur, & Co., Denton, Manchester.

Chucks.
Fairbanks Co., 78-80, City Road, London, E.C.

Cisterns, Tanks, &c.
Ashmore, Benson, Pease & Co., Ltd., Stockton-on-Tees.
F. A. Keep, Juxon & Co., Barn Street, Birmingham.

Clutches (Friction).
David Bridge & Co., Castleton Ironworks, Rochdale, Lancashire.

Colliery Plants.
Graham, Morton & Co., Ltd., Leeds.

Condensing Plant.
Benn, Sykes, Haslingden, near Manchester.
Concentric Condenser, Ltd., 23, Northumberland Avenue, London, W.C.
Mirrlees-Watson & Co., Ltd., Glasgow.

Consulting Engineers.
Gibbs, John, & Son, 80, Juke Street, Liverpool.
G. H. Hughes, A.M.I.M.E., 97, Queen Victoria Street, London, E.C.
Melville & Macalpine, 615, Walnut Street, Philadelphia, Pa., U.S.A.

Continental Railway Arrangements.
Northern Railway of France.
South Eastern & Chatham Railway Co.

Conveying and Elevating Machinery.
Adolf Bleichert & Co., Leipzig-Gohlis, Germany.
Fraser & Chalmers, Ltd., 3, London Wall Buildings, London, E.C.
Graham, Morton & Co., Ltd., Leeds.
Temperley Transporter Co., 72, Bishopsgate Street Within, London, E.C.

Coverings (Boiler).
Magnesia Coverings, Ltd., Washington Station, co. Durham.

Cranes, Travellers, Winches, etc.
Joseph Booth & Bros. Ltd, Rodley, Leeds.
Thomas Broadbent & Sons, Ltd., Huddersfield.
Niles-Bement-Pond Co., 23-25, Victoria Street, London, S.W.

Cranks.
Clarke's Crank & Forge Co., Ltd., Lincoln, England.

Cutters (Milling).
Pratt & Whitney Co., 23-25, Victoria Street, London, S.W.
E. G. Wrigley & Co., Ltd., Foundry Lane Works, Soho, Birmingham.

Destructors.
Heenan & Froude, 4, Chapel Walks, Manchester.
Horsfall Destructor Co., Ltd., Armley, Leeds.

Dredges and Excavators.
Delange & Cie, Mce., Hoboken, near Antwerp.
Rose, Downs & Thompson, Ltd., Old Foundry, Hull.

Drilling Machines.
Asquith, William, Ltd., Well Road Works, Halifax.
Niles-Bement-Pond Co., 23-25, Victoria Street, London, S.W.
Swift, George, Claremont Ironworks, Halifax.

Economisers.
E. Green & Son, Ltd., Manchester.

Ejectors (Pneumatic).
Hughes & Lancaster, 47, Victoria Street, London, S.W.

Electrical Apparatus.
Allgemeine Elektricitäts Gesellschaft, Berlin, Germany.
Broadbent, T. W., Victoria Electrical Works, Huddersfield.
Crypto Electrical Co., 3, Tyer's Gateway, Bermondsey Street, London, S.E.
Gent & Co., Ltd., Faraday Works, Leicester.
Greenwood & Batley, Ltd., Albion Works, Leeds.
India Rubber, Gutta Percha, and Telegraph Works Co., Ltd., Silvertown, London, E.
Mather & Platt, Ltd., Salford Iron Works, Manchester.
Matthews & Yates, Ltd., Swinton, Manchester.
Mix and Genest, Berlin, W., Germany.
Nalder Bros. & Thompson, 34, Queen Street, London, E.C.
New Gutta Percha Co., Ltd., Dashwood House, New Broad Street, E.C.
Newton Brothers, Full Street, Derby.
Phœnix Dynamo Manufacturing Co., Bradford, Yorks.
Sturtevant Engineering Co., Ltd., 147, Queen Victoria Street London, E.C.
Turner, Atherton & Co., Ltd., Denton, Manchester.
B. Weaver & Co., 22, Rosoman Street, Clerkenwell, London, E.C.

Engineers' Supplies.
Ahlers, Ad., Whitley Bay, near Newcastle-on-Tyne.

Engines (Gas).
Campbell Gas Engine Co., Ltd., Halifax
Soest, L., & Co., Ltd., 114-116, Victoria Street, London, S.W.

Engines (Electric Lighting).
McLaren, J. and H., Midland Engine Works, Leeds.

Engines (Locomotive).
Baldwin Locomotive Works, Philadelphia, Pa., U.S.A.
Hunslet Engine Co., Ltd., Leeds, England.
Hudswell, Clarke & Co., Ltd., Leeds, England.
McLaren, J. & H., Midland Engine Works, Leeds.

Engines (Portable).
Garrett, R., & Sons, Leiston, R.S.O., Suffolk.

Engines (Stationary).
Allis-Chalmers Co., 533, Salisbury House, Finsbury Circus, London, E.C.
Fraser & Chalmers, Ltd., 3, London Wall Buildings, London, E.C.
Garrett, R., & Sons, Leiston, R.S.O., Suffolk.
Mirrlees Watson Co., Ltd., Glasgow.

Engines (Traction).
Jno. Fowler & Co. (Leeds), Ltd., Steam Plough Works, Leeds.
Garrett & Sons, Ltd., Richard, Leiston, R.S.O., Suffolk.

Engravers.
Jno. Swain & Son, Ltd., 58, Farringdon Street, London, E.C.

Exhaust Steam Oil Separators.
Lancaster & Tonge, Ltd., Pendleton, Manchester.

Fans, Blowers.
Capel Fan Co., 13, Moseley Street, Newcastle-on-Tyne
Davidson & Co., Ltd., "Sirocco" Engineering Works, Belfast, Ireland.
Gibbs, John & Son, 80, Juke Street, Liverpool.
James Keith & Blackman Co., Ltd., 27, Farringdon Avenue, London, E.C.
Matthews & Yates, Ltd., Swinton, Manchester.

Fire Bricks.
J. H. Sankey & Son, Ltd., Essex Wharf, Canning Town, London, E.

PAGE'S WEEKLY Aerial Ropeways

ILLUSTRATED PAMPHLETS MAY BE HAD ON APPLICATION.

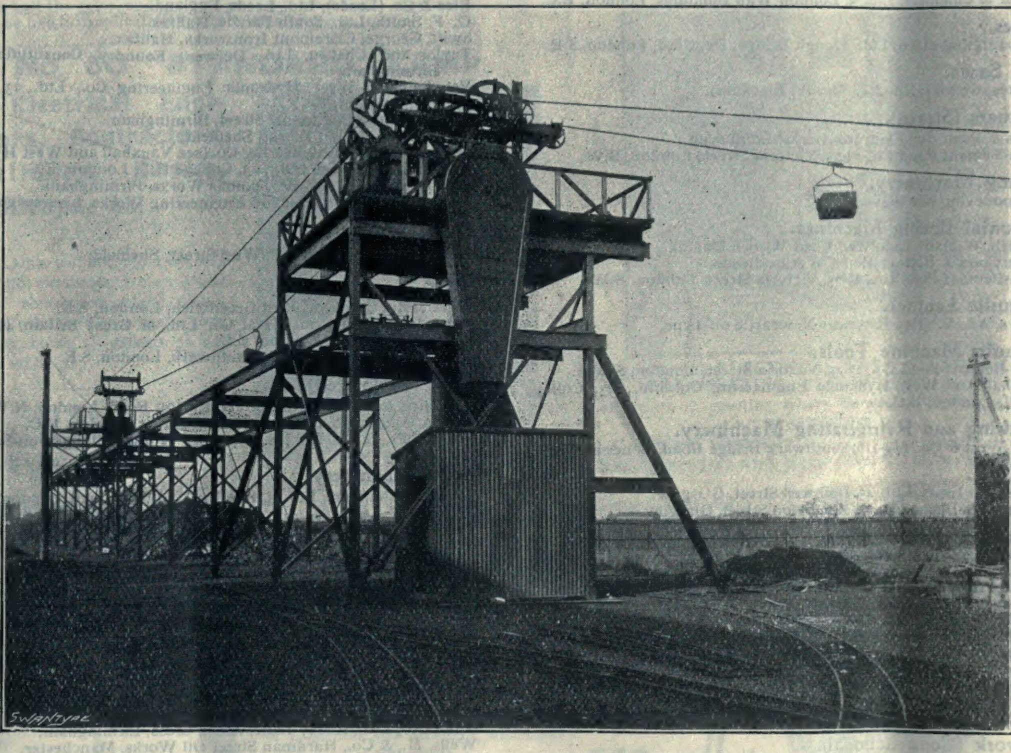
AËRIAL ROPEWAYS

AND INCLINES ON ALL SYSTEMS

CONSTRUCTED BY

BULLIVANT & CO., LTD.

EXAMPLES AT WORK ALL OVER THE WORLD.



Ropeway constructed at Queen's Ferry, Flint, for conveying coal and depositing over a given area.

Ropeways constructed to convey from 50 to 2,000 tons per day. Suitable for the transport of all descriptions of materials.

Makers of

Flexible Steel Wire Ropes for Cranes, Lifts, Hoists, etc.

Regd. Office: 72, Mark Lane, E.C. Works: Millwall, E.
Telephone: 2110 Avenue. **LONDON.**

Buyers' Directory—(*Continued*).

Firewood Machinery.
M. Glover & Co., Patentees and Saw Mill Engineers, Leeds.

Fountain Pens.
Mabie, Todd & Bard, 93, Cheapside, London, E.C.

Forging (Drop) Plants.
Brett's Patent Lifter Co., Ltd., Coventry.

Forgings (Drop).
J. H. Williams & Co., Brooklyn, New York, U.S.A.

Furnaces.
Deighton's Patent Flue & Tube Company, Vulcan Works, Pepper Road, Leeds.
Leeds Forge Co., Ltd., Leeds.
Masons Gas Power Co., Ltd., Alma Works, Levenshulme, Manchester.

Gas Producers.
Graham, Morton & Co., Ltd., Leeds.
Masons Gas Power Co., Ltd , Alma Works, Levenshulme, Manchester.

Gauge Glasses.
J. B. Treasure & Co., Vauxhall Road, Liverpool.
Tomey, J., & Sons, Aston, Birmingham.

Gauges (Pressure, Vacuum, and Hydraulic).
Dobbie, McInnes, Ltd., 45, Bothwell Street, Glasgow.

Gearing.
Ahlers, Ad., Whitley Bay, near Newcastle-on-Tyne.
Asquith, William, Ltd., Well Road Works, Halifax.
Reid Gear Co., Linwood, near Glasgow.
Wild, M. B., & Co., Corporation Street, Birmingham.

Gold Dredging Plant.
Fraser & Chalmers, Ltd., 3, London Wall Buildings, London, E.C.

Greases.
Blumann and Stern, Ltd., Plough Bridge, Deptford, London, S.E.

Hack Saws.
Baynes, Charles, Knuzden Brook, Blackburn.

Hammers (Steam).
Davis & Primrose, Leith Ironworks, Edinburgh.
Niles-Bement Pond Co., 23-25, Victoria Street, London, S.W.

Hoisting Machinery.
See Conveying Machinery.

Horizontal Boring Machines.
Asquith, William, Ltd., Well Road Works, Halifax.
Greenwood & Batley, Albion Works, Leeds.
Niles-Bement Pond Co., 23-25, Victoria Street London, S.W.

Hydraulic Leather.
Ahlers, Ad., Whitley Bay, near Newcastle-on-Tyne.

Hydraulic Machine Tools.
Niles-Bement-Pond Co., 23-25, Victoria Street, London, S.W.
Vauxhall and West Hydraulic Engineering Co. Ltd., 23, College Hill, London, E.C.

Icemaking ana Refrigerating Machinery.
H. J. West & Co., 114-118, Southwark Bridge Road, London, S.E.

Indicators.
Dobbie McInnes, Ltd., 45, Bothwell Street, Glasgow.
Hannan & Buchanan, 75, Robertson Street, Glasgow.

Iron and Steel.
Allen, Edgar, & Co. Ltd., Imperial Steel Works, Sheffield.
Askham Bros. & Wilson, Ltd., Sheffield.
Consett Iron Co., Ltd., Consett, Durham, and Newcastle-on-Tyne.
Fairley & Sons, James, Old Mint, Shadwell Street, Birmingham.
Farnley Iron Co., Ltd., Leeds. England.
Fried. Krupp, Grusonwerk, Magdeburg-Buckau, Germany.
J. Frederick Melling, 14, Park Row, Leeds, England.
Parker Foundry Co., Derby.
Purden, John & Sons, Lambhill Forge, by Maryhill, Glasgow.
Walter Scott, Ltd., Leeds Steel Works, Leeds, England.
Gilbert Thompson & Co., 116, Victoria Street, London, S.W.

Ironwork (Constructional).
F. A. Keep, Juxon & Co., Barn Street, Birmingham.

Ironwork (Galvanised).
F. A. Keep, Juxon & Co., Barn Street, Birmingham.

Lagging Sheets.
Zeitz & Co., 21, Lime Street, London, E.C.

Lathes.
Asquith, William, Ltd., Well Road Works, Halifax.
Bradbury & Co., Ltd., Wellington Works, Oldham.
Eclipse Tool Manufacturing Co., Linwood, near Glasgow.
Leckenby, Benton, & Co., Perseverance Ironworks, Halifax.
Mitchell, D., & Co., Ltd., Central Ironworks, Lawkholme, Keighley.
Niles-Bement-Pond Co., 23-25, Victoria Street, London, S.W.
Northern Engineering Co. (1900) Ltd., King Cross, near Halifax.
Swift, George, Claremont Ironworks, Halifax.

Lathe Carriers.
Williams, J. H., & Co., Brooklyn New York, U.S.A.

Laundry Machinery.
W. Summerscales & Sons, Ltd., Engineers, Phœnix Foundry Keighley, England.

Lifts.
Waygood & Co., Ltd., Falmouth Road, London, S.E.

Lubricants.
Blumann & Stern, Ltd., Plough Bridge, Deptford, London, S.E.
Reliance Lubricating Oil Co., The, 19 & 20, Water Lane, Great Tower Street, London, E.C.
Matthew Wells & Co., Hardman Street Oil Works, Manchester.

Machine Tools.
Asquith, William, Ltd., Well Road Works, Halifax.
George Addy & Co., Waverley Works, Sheffield.
Bateman's Machine Tool Co., Hunslet, Leeds.
Bertrams, Ltd., St. Katherine's Works, Sciennes, Edinburgh.
Bradbury & Co., Ltd., Wellington Works, Oldham.
Breuer, Schumacher & Co., Ltd., Kalk, near Cologne-on-Rhine (Germany).
Cunliffe & Croom, Ltd., Broughton Ironworks, Manchester.
Dean, Smith & Grace, Ltd., Keighley.
Greenwood & Batley, Ltd., Leeds.
Jones & Lamson Machine Co., 97, Queen Victoria Street, London, E.C.
John Lang & Sons, Johnstone, near Glasgow.
Luke & Spencer, Ltd., Broadheath, Manchester.
Mitchell, D., & Co., Ltd., Central Ironworks, Lawkholme, Keighley.
Jos. C. Nicholson Tool Co., City Rd. Tool Wks., Newcastle-on-Tyne.
Niles-Bement-Pond Co., 23-25, Victoria Street, London, S.W.
Noble & Lund Ltd., Felling-on-Tyne.
Northern Engineering Co., 1900, Ltd., King Cross, near Halifax.
J. Parkinson & Son, Canal Ironworks, Shipley, Yorkshire.
C. Redman & Sons, Halifax.
Rice & Co. (Leeds), Ltd., Leeds, England.
G. F. Smith, Ltd., South Parade, Halifax.
Swift, George, Claremont Ironworks, Halifax.
Taylor and Challen, Ltd., Derwent Foundry, Constitution Hill Birmingham.
Vauxhall and West Hydraulic Engineering Co., Ltd., 23, College Hill, London, E.C.
H. W. Ward & Co., Lionel Street, Birmingham.
T. W. Ward, Albion Works, Sheffield.
West Hydraulic Engineering Co. (see Vauxhall and West Hydraulic Engineering Co. Ltd.), 23, College Hill, London, E.C.
Winn, Charles, & Co., St. Thomas Works, Birmingham.
Yorkshire Machine Tool and Engineering Works, Liversedge, Yorks.

Marks.
Pryor, Edward, & Son, 68, West Street, Sheffield.

Metals.
Delta Metal Co., Ltd., East Greenwich, London, S.E.
Magnolia Anti-Friction Metal Co., Ltd., of Great Britain, 49, Queen Victoria Street, London, E.C.
Phosphor Bronze Co., Ltd., Southwark, London, S.E.

Metals (Perforated).
W. Barns & Son, Chalton Street, Euston Road, London, N.W.
Brown, Andrew, & Co., 110, Cannon Street, London, E.C.
Méguin, Fr., & Co., Ltd., Engineering Works, Dillingen-on-Saar.

Mining Machinery.
Fraser & Chalmers, Ltd., 3, London Wall Buildings, London, E.C.

Office Appliances.
Halden & Co., J., 8, Albert Square, Manchester.
Hall & Co., B. J., 39, Victoria Street, London, S.W.
Inglesant, T., & Sons, Ltd., Atlas House, Leicester.
Lyle Co., Ltd., Harrison Street, Gray's Inn Road, London, W.C.
Rockwell-Wabash Co. Ltd., 69, Milton Street, London, E.C.
Shannon, Ltd., Ropemaker Street, London, E.C.
Trading and Manufacturing Co., Ltd., Temple Bar House, Fleet Street, London, E.C.

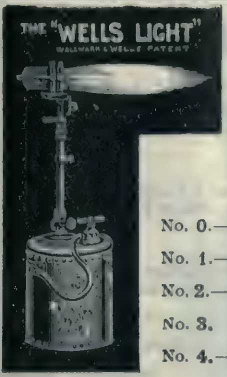
Oils, &c.
Blumann and Stern, Ltd., Plough Bridge, Deptford, London, S.E.
Valor Co., Ltd., Rocky Lane, Aston Cross, Birmingham.
Wells, M., & Co., Hardman Street Oil Works, Manchester.

Packing.
Beldam Packing & Rubber Co., 93-94, Gracechurch Street, London, E.C.
Frictionless Engine Packing Co., Ltd., Hendham Vale Works, Harpurhey, Manchester.
Lancaster & Tonge, Ltd., Pendleton, Manchester.
Redfern & Co., S., Swan Lane, New Brown Street, Manchester.
Quaker City Rubber Co., Coronation House, Lloyd's Avenue, E.C.
United States Metallic Packing Co., Ltd., Bradford.
J. Bennett von der Heyde, 6, Brown Street, Manchester.

Paper.
Lepard & Smiths, Ltd., 29, King Street, Covent Garden, London, W C.

Patent Agents.
Page & Rowlingson, 28, New Bridge Street, London, E.C.

PAGE'S WEEKLY Wells' Specialities



PORTABLE LIGHT FROM OIL

UP TO 4,000 CANDLE POWER.

Adopted by 26 Governments and all Leading Firms. Over 1,500 supplied to British and Foreign Railways.

EACH LAMP GUARANTEED.

Horizontal Flame Unaffected by Weather.

OVER 18,000 SOLD

	PRICE COMPLETE.		
No. 0.—500 Candles, small hand pattern, for petroleum	£7	7	0
No. 1.—1,500 Candles, hand pattern, with No. 2 size burner for Tar Oil ...	£10	0	0
No. 2.—1,500 Candles, useful and portable pattern	£15	10	0
No. 3. 2,500 Candles, Manchester Ship Canal pattern	£16	10	0
No. 4.—3,500 Candles. A most powerful lamp...	£17	15	0

These Lamps are arranged to burn Kerosene or Petroleum when sent to Foreign Countries; but in Great Britain our Special Wells Oil is supplied, which is half the price, and gives 30 per cent. more light. Special prices for our oil may be had on application to our Agents or direct to us.

No. 50 "STANDARD" LAMP.

For Electrical Engineers, Contractors, Builders, Docks, Railways, &c.

This Lamp will not blow out in a high wind, produces a clear white light of about 200 candle power, from ordinary paraffin or petroleum. The tank holds 1½ gallons of oil, burning six hours.

Price **£3** each.

Extra Burners **3/-** each.

WELLS' OIL GAS GENERATING LAMP No. 40.

Weight, 10 lb. Capacity, 7 pints. Burning about 7 hours.

Made in Sheet Steel, with top and bottom of our "Unbreakable" Metal, for Lightness and Strength, with large Capacity.

Price, with Single Burner...	16/-	each.
,, Double ,, ...	19/-	,,
Tripod Stands	3/-	,,
Extra Burners	2/-	,,

A. C. WELLS & Co.,

100a, Midland Road, St. Pancras,
LONDON, N.W.

WELLS' "LIGHTNING PAINTER."

(WALLWORK AND WELLS' PATENTS.)

PAINTING BY MACHINE.

Great Saving in Time, Paint, and Labour.

PAINTING SPEED—3 square yards a minute.

The paint is sprayed evenly and continuously through a flexible tube and nozzle supplied with compressed air, either from existing air main or from our special Compressors.

No. 1 Painter (as above Illustration) ...	£25	0	0
No. 2 ,, ...	£30	0	0
No. 3 ,, ...	£35	0	0
Single Air Compressor	£17	10	0
Double Air Compressor	£27	0	0

HAND AIR COMPRESSORS, Paint Holder and Sprayer Combined.

Invaluable for ELECTRICAL WORK, STENCILLING, ORNAMENTING, DECORATING, &c., or any class of painting where the work is not very heavy or continuous.

Price, Complete ... ... £16.

Hand Sprayer and Hose supplied separately, £9.

Supplied to 12 Governments, principal Railways, and leading Firms in Great Britain.

VERTICAL STEAM ENGINE AND AIR COMPRESSOR.

Price £100.

No. 2 Painter, extra, £30.

OVER 500 PLANTS SOLD.

Buyers' Directory—(*Continued*).

Photo Copying Frames.

J. Halden & Co., 8, Albert Square, Manchester.
B. J. Hall & Co., 39, Victoria Street, London, S.W.

Photographers.

Booker & Sullivan, 67 and 69, Chancery Lane, W.C.
Elliott & Fry, 55, Baker Street, London, W.

Pinch Bars.

Samson & Co., Garforth, near Leeds.

Pipe Wrenches (Chain).

Williams, J. H., & Co., Brooklyn, New York, U.S.A.

Pistons.

Lancaster & Tonge, Ltd., Pendleton, Manchester.

Planished Sheets.

Zeitz & Co., 21, Lime Street, London, E.C.

Porcelain.

Gustav Richter, Charlottenburg, near Berlin, Germany.

Presses (Hydraulic).

Greenwood & Batley, Albion Works, Leeds
Niles-Bement-Pond Co., 23-25, Victoria Street, London, S.W.

Publishers.

Crosby Lockwood & Son, 7, Stationers' Hall Court, London, E.C.
Charles Griffin & Co., Ltd., Exeter Street, Strand, London, W.C.
Spon, E. and F. N., 125, Strand, W.C.
New Zealand Mines Record, Wellington, New Zealand.

Pumps and Pumping Machinery.

Drum Engineering Co., 27, Charles Street, Bradford.
Enke, Carl, Schkeuditz-Leipzig, Germany.
Fairbanks, Morse & Co., 126, Southwark Street, London, S.E.
Fraser & Chalmers, Ltd., 3, London Wall Buildings, London, E.C.
J. P. Hall & Sons, Ltd., Peterborough.
Hathorn, Davey & Co., Ltd., Leeds, England.
Positive Rotary Pumps, Ltd., 23, Northumberland Avenue, London, W.C.
Tangyes, Ltd., Cornwall Works, Birmingham.

Radial Drilling Machines.

Asquith, William, Ltd., Well Road Works, Halifax.
Greenwood & Batley, Albion Works, Leeds.
Niles-Bement-Pond Co., 23-25, Victoria Street, London, S.W.
Northern Engineering Co. (1900), Ltd., King Cross, near Halifax
Swift, George, Claremont Ironworks, Halifax.

Rails.

Wm. Firth, Ltd. Leeds.

Railway Wagons.

Nye, A. W., 110, Cannon Street, London, E.C.
W. R. Renshaw & Co., Ltd., Phœnix Works, Stoke-on-Trent.

Riveted Work.

F. A. Keep, Juxon & Co., Forward Works, Barn Street, Birmingham.

Roller Bearings.

Hyatt Roller Bearing Co., 47, Victoria Street, London, S.W.

Roofs.

D. Anderson & Son, Ltd., Lagan Felt Works, Belfast.
Graham, Morton & Co., Ltd., Leeds.
Head, Wrightson & Co., Ltd., Thornaby-on-Tees.

Ropeways (Aerial).

Bullivant & Co., Ltd., 72, Mark Lane, London, E.C.

Scientific Instruments.

Cambridge Scientific Instrument Co., Ltd. Cambridge.

Spanners.

Williams, J. H., & Co., Brooklyn, New York, U.S.A.

Stampings.

Thomas Smith & Sons of Saltley, Ltd., Birmingham.
Williams, J. H., & Co., Brooklyn, New York, U.S.A.

Stamps (Rubber).

Rubber Stamp Co., 1 & 2, Holborn Buildings, Broad Street Corner, Birmingham.

Stamps (Metal).

Edward Pryor & Son, 68, West Street, Sheffield.

Steam Traps.

British Steam Specialties, Ltd., Fleet Street, Leicester.
Lancaster & Tonge, Ltd., Pendleton, Manchester.

Steam Wagons.

Thornycroft & Co., Ltd., J. I., Chiswick, London, W.
Yorkshire Patent Steam Wagon Co., Pepper Road, Hunslet, Leeds

Steel Tools.

Saml. Buckley, St. Paul's Square, Birmingham.
Pratt & Whitney Co., 23-25, Victoria Street, London, S.W.

Steel Structures.

Ashmore, Benson, Pease & Co., Ltd., Stockton-on-Tees.

Stokers.

Ed. Bennis & Co., Ltd., Bolton, Lancs.
Meldrum Brothers, Ltd., Atlantic Works, Manchester.

Stone Breakers.

S. Pegg & Son, Alexander Street, Leicester.

Superheaters.

A. Bolton & Co., 40, Deansgate, Manchester.

Time Recorders.

Howard Bros., 40, Paradise Street, Liverpool, and 100c, Queen Victoria Street, London, E.C.
Recorders, Ltd., 171, Queen Victoria Street, London, E.C.
Warwick's Time Stamp Co., 134, Highbury Hill, London, N.

Tubes.

Premier Boiler Tubes, Ltd., 28, Victoria Street, London, S.W.
Thomas Piggott & Co., Ltd., Spring Hill, Birmingham.
Tubes, Ltd., Birmingham.

Turbines.

Greenwood & Batley, Albion Works, Leeds.
S. Howes, 64, Mark Lane, London, E.C.

Typewriters.

Elliott-Fisher Co., 75, Cannon Street, London, E.C.
Empire Typewriter Co., 77, Queen Victoria Street, London, E.C.
Yost Typewriter Co., 50, Holborn Viaduct, London, E.C.

Valves.

Holmes & Co., W. C., Huddersfield.
Hunt & Mitton, Crown Brass Works, Oozells Street North Birmingham.
Scotch and Irish Oxygen Co., Ltd.. Rosehill Works, Glasgow.
Shaw, Joseph, Albert Works, Huddersfield.
Winn, Charles, & Co., St. Thomas Works, Birmingham.

Ventilating Appliances.

Matthews & Yates, Ltd., Swinton, Manchester.

Wagons—Steam.

Thornycroft & Co., J. I., Ltd., Chiswick, London, W.

Weighing Apparatus.

W. & T. Avery, Ltd., Soho Foundry, Birmingham, England.
Samuel Denison & Son, Hunslet Moor, near Leeds.
Graham, Morton & Co., Ltd., Leeds.

Wells Light.

A. C. Wells & Co., 100A, Midland Road, St. Pancras, London, N.W

Wind and Water Supply Machinery.

Eric S. A. Smith, Bridlington.

Wire Working Machinery.

Ed. Brand, 35, Shakespeare Street, Manchester.

"Woodite."

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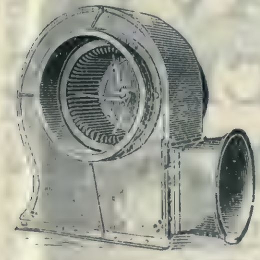

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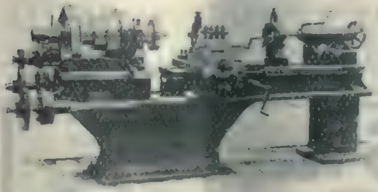

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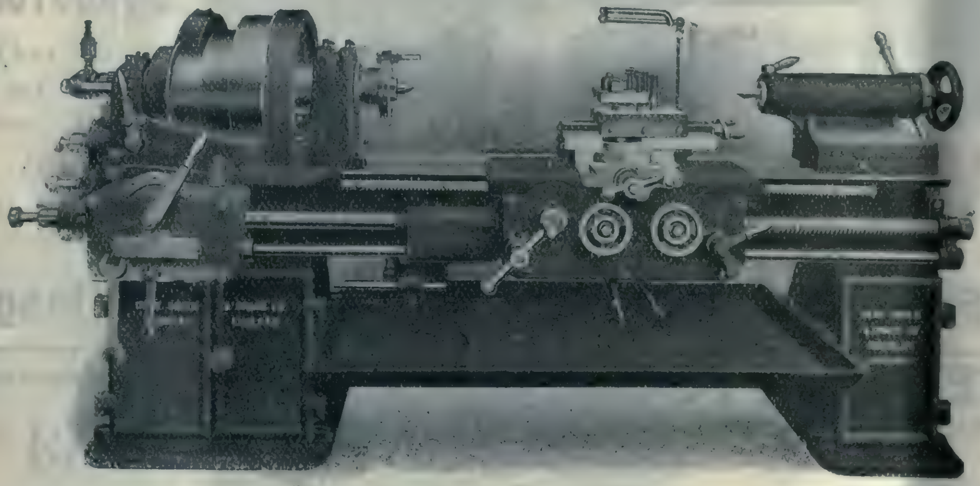

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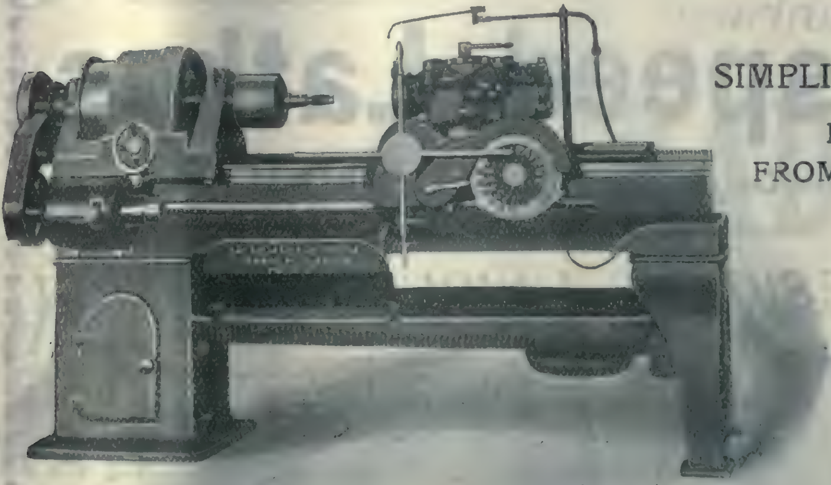

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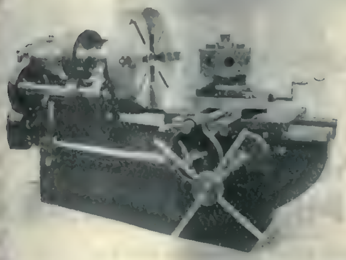

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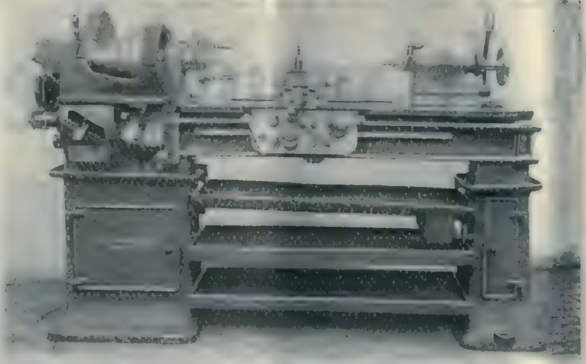

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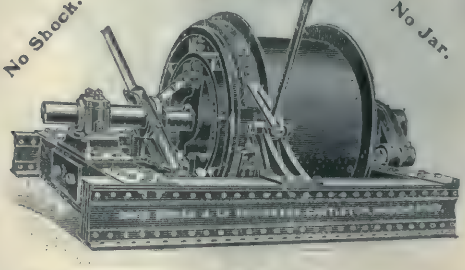

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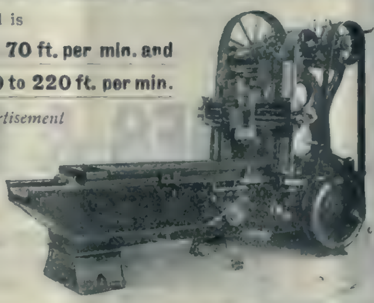

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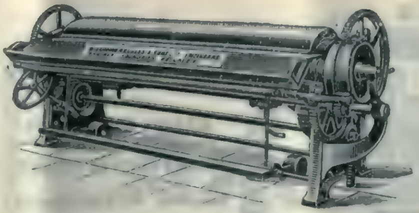

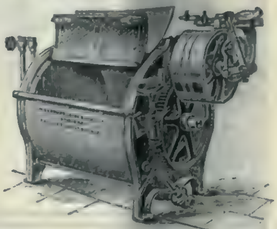

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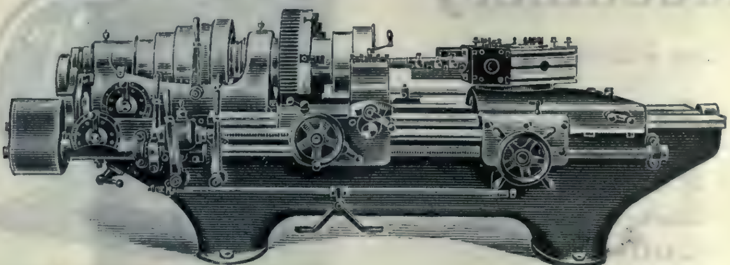

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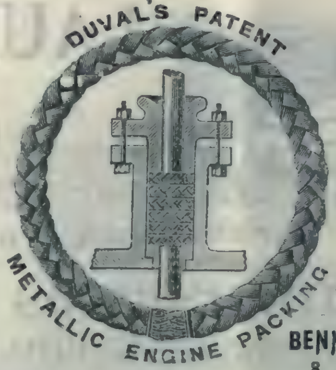

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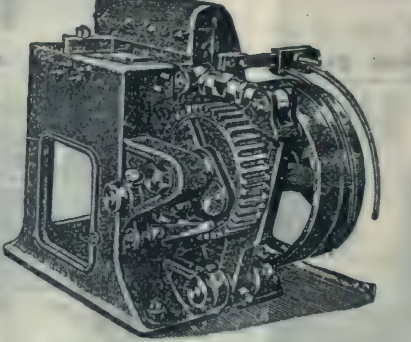

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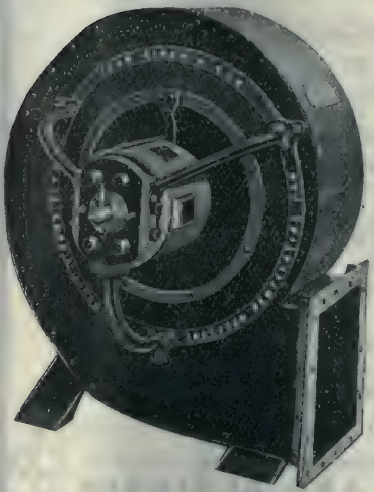

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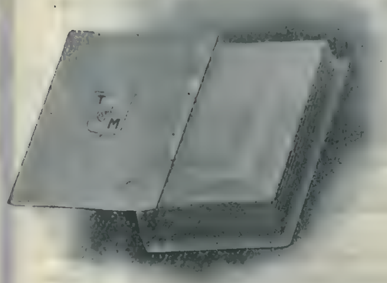

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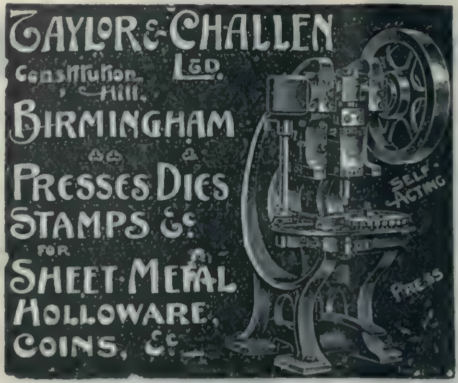

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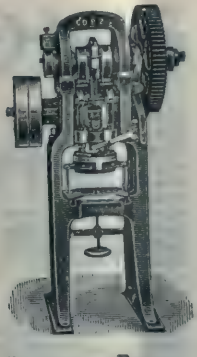

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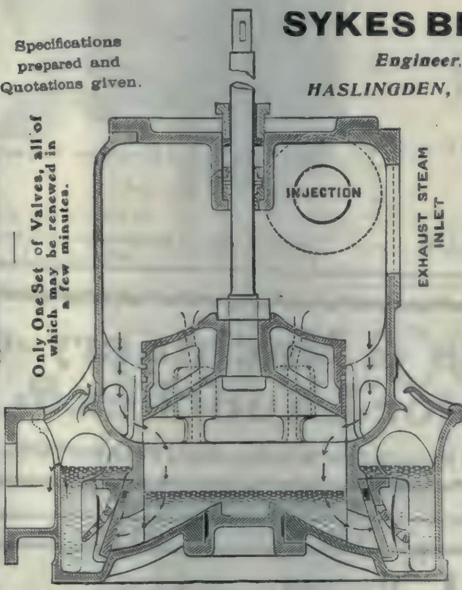

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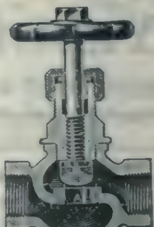

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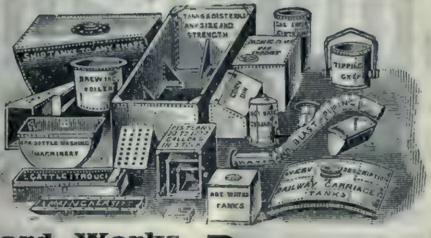

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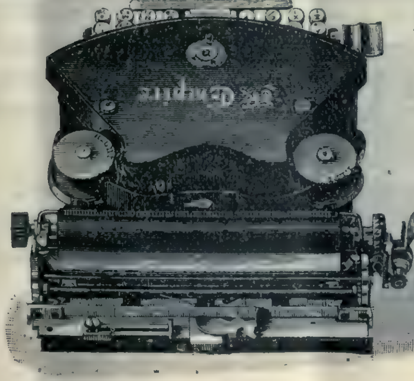

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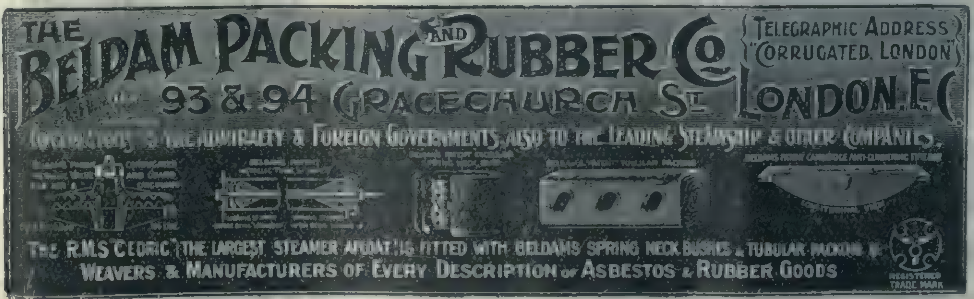

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PAGE'S WEEKLY

An Illustrated Technical Weekly, dealing with the Engineering, Electrical, Mining, Iron and Steel, and Shipbuilding Industries.

VOL. VII. LONDON, FRIDAY, JULY 28, , 1905. No. 46.

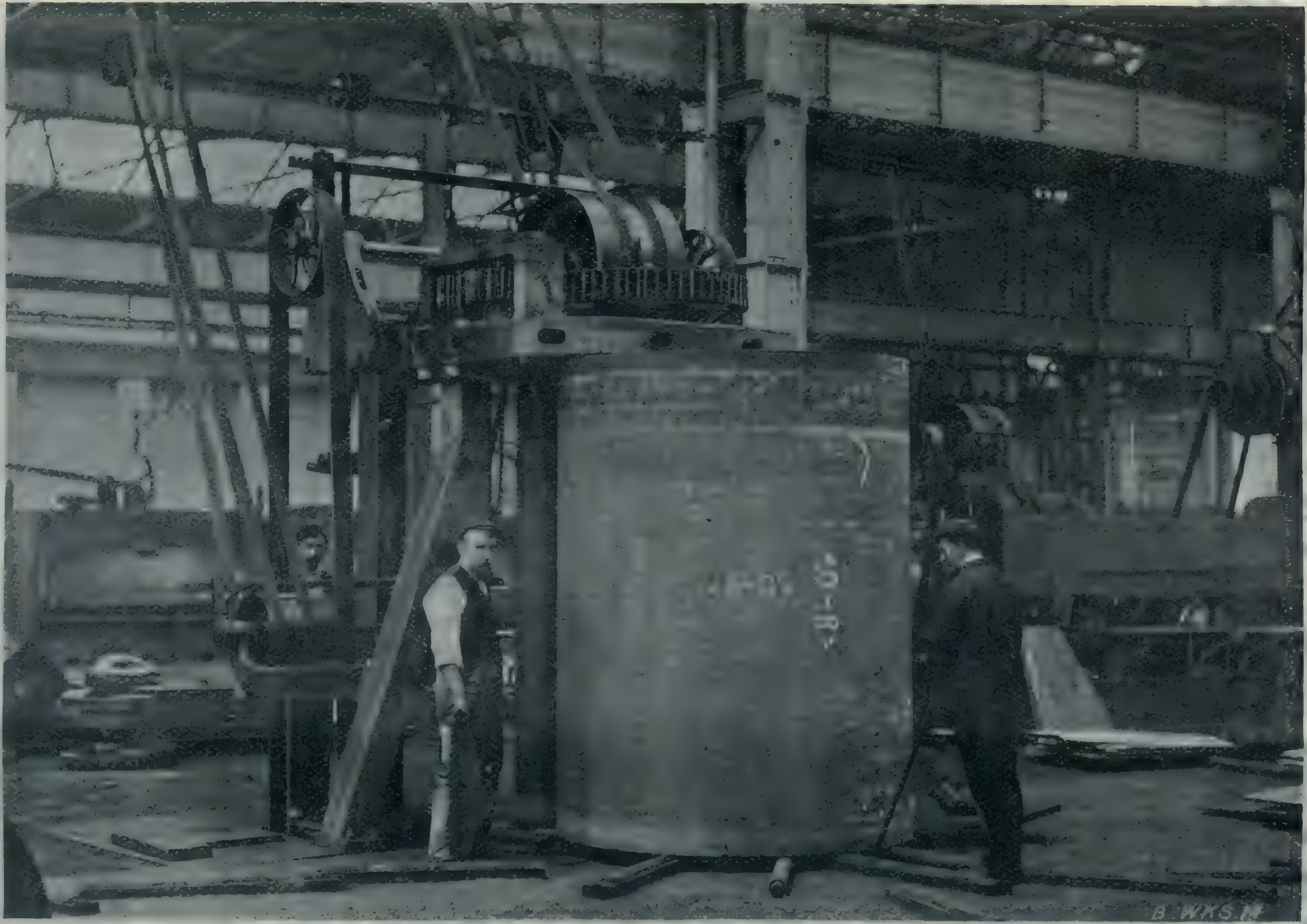
The Offices of "Page's Weekly," Wednesday Evening.

THE parliamentary inquiry into the London Electric Power Bill drags wearily along. It is the cheap supply of current for power offered which has enabled the promoters to reach the stage of inquiry. The cost of one horse-power by steam varies between £9 and £13 per annum, but with electricity at ¾d. per unit, it is said that the manufacturer would get the same power for £3 2s. 6d., and the power area included in the Bill, the whole of the eastern half of London is said to be using 600,000 h.p., which, it is claimed, would represent saving of a vast sum in power charges every year which would be available for development purposes. The argument is plausible, and it is not surprising that a good many people have had their imagination fired by the picture drawn. Hence notwithstanding the complaints made on behalf, of the existing companies and the objection raised to the creation of this huge monopoly by public bodies, it is clear that the new project has strong support, and on the financial side the Bill gives evidence of the *bona fides* of the promoters by a proposal for a sliding scale dividend, under which the standard of 8 per cent. is only payable when the average price of current to the consumer is ¾d. per unit.

One point which has not received all the attention it deserves is that the existing supply companies were under the Acts which called them into being, expressly excluded from the benefits of common working, and it seems manifestly unfair to grant to a new-comer powers

DUGALD CLERK, M.INST.C.E., F.C.S.

Who has just been elected President of the Junior Institution of Engineers. Mr. Clerk, whose professional career has been mainly devoted to the study of the gas engine—both from a practical and theoretical standpoint—was born at Glasgow in 1854. Upon the completion of his education at the Yorkshire College of Science, he underwent a term of apprenticeship in his father's works, subsequently joining the firm of Messrs. Thomson and Co., when he took out his first gas-engine patent. He now practises as a consulting engineer and is a director of the National Gas Engine Company, Ltd.



VERTICAL PLATE BENDING ROLLS IN THE NEW WORKS OF MESSRS. RUSTON, PROCTOR, AND COMPANY, LTD.

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which have been refused to those who have done the pioneer work in the metropolis. Municipalities who have had to pay so heavily to get rid of the water monopoly, and who are still suffering from a powerful gas monopoly, were not likely to give anything but the most uncompromising opposition to this new scheme. No less than twenty-four London local authorities originally joined in opposition to it, but some of these have now withdrawn their opposition.

It is pointed out that some of the London authorities, notably St. Pancras Borough Council, are already supplying current at 1d. per unit without the conditions which the new Company will seek to impose, and it is stated that before the companies could get to work the St. Pancras authorities will bring their charges still lower. Indeed, we are told that the St. Pancras authorities have latterly been offering to supply shops and warehouses with electric lights during the day at 1d. per unit in order to increase the day load, whereas the Bill of the new Company provides that where it takes over an existing company it is to be empowered to levy the same charges for lighting as then exist, so that it is possible that with power supplied at ¾d. per unit, high lighting rates may be imposed. However, most of the manufacturers' in the district affected are naturally supporting the new undertaking. Some of them are already generating their own electricity at about ¾d. per unit, and certainly if, as they appear to think, the new Company can better this charge they will take their power from the new undertaking.

The annual report of Leeds University referred to last week is an excellent record of work done, but the University is by no means immune from the crying needs which are almost invariably experienced in a growing institution. For instance, at Leeds they are in urgent need of more accommodation in the shape of electrical engineering laboratories and additional plant is much required, particularly two direct-current electro-motors of 24 h.p. and 10 h.p. respectively. The professor of engineering reports that the work of his department is hampered by overcrowding in the drawing office and laboratory. Researches have been conducted in the department (i.) on the effect of water injection in an oil engine cylinder and on the heat rejected in the exhaust products; (ii.) on two smoke prevention appliances; (iii.) on an automatic smoke recorder for registering the amount of smoke passing up a chimney.

Mr. T. Lane Carter, who has lately returned to Johannesburg from a long trip north of the Zambesi, has been giving his fellow members of the Chemical, Metallurgical, and Mining Society of South Africa, some useful hints on the subject of copper prospecting. He remarks that in the first place the prospector should know copper when he sees it, and not mistake something else for copper. A case is mentioned where a number of claims were staked out along a bold outcrop, beacons placed, etc., but when the prospect was sampled and assayed the coloured material turned out to be a silicate of iron, without a trace of copper. As to the amount of chemicals and appliances to be taken on an expedition, everything depends on circumstances. If one is to leave assay office and laboratories entirely behind and wishes to assay the copper samples at each prospect, then it it necessary to have a complete outfit. This outfit must indeed be complete, for a whole expedition might be hampered by leaving behind an important chemical.

A sharp look-out should be kept for gold in all copper ores. Three or four dwts. of gold to the ton makes all the difference in a copper prospect. Quite a satisfactory charcoal is made from Central African wood. Home-made pots and the native furnace which has been used from time immemorial by the kaffirs in making iron must answer, if the prospector has nothing better. A small folding travelling balance is required for weighing the gold beads. A good method for determining gold in copper ores is given in Furman's "Assaying." The choice of methods for the determination of copper will probably lie between the electrolytic and potassium cyanide methods. Of the two the KCN is preferable on an expedition.

Copper is nearly as disappointing as gold, and one should remember that of the many prospects met, the chances are that few will ever develop into mines. There is no part of mining where sound judgment and practical experience are of more importance than in the examination and "sizing up" of a copper prospect. When a mine is developed, and the engineer can take hundreds of samples and make surveys, his task is not over difficult. In examining copper prospects one should pay a lot of attention to the geological characteristics of the surrounding country. It is a mistake to devote one's whole time to the minute examination of the deposit, and little to the rocks of the district, for the investigator can frequently acquire information that will be of much assistance in sizing up a prospect. He carefully notes the dip of the strata, and whether the surrounding country rock changes. The change in depth from one country rock to another does not necessarily mean that the deposit gives out, but such a change indicates possible "breakers ahead." An important illustration of the effect that a change of country rock has on a lode is afforded by the Dolcoath Mine, Cornwall, where the lode produced copper ore, the country rock being slate, but changed into a tin producer as the lode got into granite country.

In examining copper prospects the engineer decides whether the future possibilities point to the opening up of large individual mines, like Rio Tinto, or Calumet and Helca, or to a number of small copper producers, each mine sending its quota of ore to a large smelting centre. It is impossible to foretell what the future of the copper industry of South Africa will be, but Mr. Carter believes that some day there will be a big metallurgical centre within a radius of fifty miles of the Victoria Falls, probably on ground somewhat higher and healthier than is the country in the immediate Zambesi valley. All the power required to run such a centre is available by electric transmission. With such a metallurgical centre, small "pocketty" copper mines producing a few hundred tons per month of clean, high-grade copper ore, would pay well. A place of this kind would prove a blessing not only to Northern Rhodesia and the country beyond, but to the country south of the Zambesi, where there are plenty of small copper propositions which will yet be heard from, providing smelting works are opened up.

The following figures, showing the production of iron and steel in the United States in 1904, with comparative figures for the preceding year, are taken from information supplied by the Americaan Iron and Steel Association :—

Articles.	1903.	1904.
	Tons.	Tons.
Pig-iron	18,009,252	16,497,033
Spiegeleisen, ferro-manganese and ferro-phosphorus, included in pig-iron	192,661	220,392
Bessemer steel	8,592,829	7,859,140
Open-hearth steel	5,829,911	5,908,166
Crucible steel	102,434	83,391
Blister and patented steel	9,804	9,190
Total steel	14,534,978	13,859,887
Open-hearth steel castings	400,348	302,334
Other kinds of steel castings	29,917	27,877
Bessemer steel rails	2,946,756	2,137,957
Open-hearth steel rails	45,054	145,883
Iron rails	667	871
Total rails	2,992,477	2,284,711
Structural shapes	1,095,813	949,146
Iron and steel wire rods	1,503,455	1,699,028
Plate and sheet iron and steel, except nail plate	2,599,665	2,421,398
Bar, bolt, hoop, skelp, rolled axles, rolled armour plate, &c.	4,952,185	4,597,497
All rolled iron and steel, including nail plate and excluding rails	10,215,220	9,728,670
All rolled iron and steel, including both nail plate and rails	13,207,697	12,013,381
Tin plates and terne plates	480,000	458,000
	Kegs. of 100 lbs	Kegs. of 100 lbs
Cut nails and cut spikes	1,435,893	1,283,362
Wire nails	9,631,661	11,926,661

NOTE.—The ton mentioned above is the gross ton of 2,240 lbs.

In view of the exceptional interest attaching to the generating station now being erected at Park Royal, which will supply energy for the first Great Western lines to be worked electrically and supersede the present Paddington electric light station for lighting the London area, the Great Western Railway Magazine reports the progress of the work in its current number. The building will consist of an engine house 120 ft. by 108 ft., boiler house 114 ft. by 92 ft., stores and workshop 120 ft. by 25 ft., offices for the engineer-in-charge and his staff, mess-rooms, battery-rooms, etc. The walls of the station are of brick, with patent Victoria stone dressings, while the roof will be of steel and slate, supported entirely by steel stanchions quite independent of the walls. Four large cooling towers are being provided, and a chimney stack 250 ft. high. This stack, which may be seen from trains passing between Paddington and Acton, is to the right of the building, and rests on a cement concrete block, 44 ft. 6 in. square by 17 ft. deep. Concurrently with the erection of the building, arrangements are being made for the supply and fixing of the machinery. The boilers will be of the water-tube type, manufactured by Messrs. Babcock and Wilcox, and will be provided with mechanical stokers. There will be eight 1,200 h.p. engines, each coupled direct to a high tension 3-phase generator, and current will be supplied to sub-stations at 6,000 volts, to be there transformed to 600 volts for traction purposes.

The irrigation projects in India, to which we recently called attention, are dealt with in a parliamentary paper, which is also concerned with Indian railways at present under construction. We reproduce the following table which presents a precise summary of the irrigation proposals, with details of estimated costs and distances covered :—

STATEMENT showing the FINANCIAL POSITION in respect of MAJOR IRRIGATION PROJECTS in INDIA now in course of Construction.

——	LENGTH.		Estimated Total Cost.	Approximate Expenditure to 31st March 1905.	Liability outstanding on 31st March 1905.	Proposed Expenditure in 1905-1906.	Estimated Liability on 31st March 1906.
	Main Canals and Branches.	Distributaries.					
BURMA.	Miles.	Miles.	Rs.	Rs.	Rs.	Rs.	Rs.
Mandalay Canal - - - -	39½	120	49,47,900	48,51,280	96,620	53,000	43.620
Shwebo Canal - - - -	77	193	46,28,060	36,49,600	9,78,460	7.40,000	2,38,460
Môn Canals - - - -	54	75½	42,63,840	4,57,800	38,06,040	8,01,000	30,05,040
PUNJAB.							
Jhelum Canal - - - -	238½	1,203½	1,83,95,780	1,40,99,220	42,96,560	19,00,000	23,96,560
Upper Jhelum Canal - - - -	128	562	2,90,70,400	30,000	2,90,40,400	14,50,000	2,75,90,400
Upper Chenab Canal - - -	194	1.092	2,89,29,790	30,000	2,88,99,790	15,00.000	2.78,99.790
Lower Bari Doab Canal - - -	196	1.060	1,78,11,840	—	1,78,11,840	Nil	1,78,11.840
N.-W. FRONTIER PROVINCE.							
Paharpur Canal - - - - -	42	15	7,07,700	—	7,07,700	2,00,000	5,07,700
BOMBAY.							
Dad Canal - - - -	86⅓	234⅓*	26,27,410	21,95,280	4,32,130	34.000	3,98.130
Naulakhi Canal - - - -	53	105¼*	12,17,940	5,110	12,12,830	2,10,000	10,02,830
Nasrat Canal - - - -	83	50*	16,58,160	16,29,160	29,000	29,000	—
Mahiwah Canal - - - -	57½	—	15,62,740	13,23,740	2,39,000	2,39,000	—
MADRAS.							
Nagavalli River Project - - -	21	—	10,26,610	—	10,26,610	—	10,26.610
TOTAL - -	1,269⅚	—	11,68,48,170	2,82,71,190	8,85,76,980	71,56,000	8,14,20,980

* These distributaries are described as Branches in the Estimates for the projects.

PAGE'S WEEKLY

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NEWS ITEMS.

In view of the rejection of their Tramways Bill by the House of Lords last Tuesday, the London County Council are proposing to revive the Bill in its entirety next Session.

Professor W. H. Watkinson, of the Glasgow and West of Scotland Technical College, has been appointed to the Harrison Chair of Engineering in the Liverpool University, rendered vacant by the resignation of Professor Hele-Shaw.

Mr. Henry Briggs, assistant demonstrator in mining at the Royal School of Mines, London, has been awarded the "Honours" Associateship of the Royal School of Mines in the division of mining. This is the first and only occasion this degree has been conferred.

The Sheffield Steel Makers, Ltd., have been granted exclusive licence to work the Héroult electric steel-smelting process by the Société Electro-Metallurgique Française, and it is stated that the firm is making arrangements for erecting special works for the manufacture of steel under the Héroult patents.

Mr. F. S. W. Cornwallis, of Linton Park, Maidstone, has, at the request of members of the Committee of Selection of the Royal Agricultural Society, consented to allow himself to be placed in nomination for election as president of the society for 1905-6. The annual general meeting of governors and members will be held on Tuesday.

A return of vessels totally lost condemned, etc., during the last quarter of 1904, issued by Lloyd's Register of British and Foreign Shipping, shows a total of 193 vessels. Of this total 70 vessels, of 91,979 tons gross were steamers, and 123, of 54,355 tons, were sailing ships.

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High Capacity Wagons for the Tyne.

The North-Eastern Railway Company have stated their willingness to give the River Tyne Commissioners an assurance that until the close of 1920 they will not, without the assent of the commissioners, use for traffie to the commissioners' shipping places on the Tyne, any type of wagon exceeding to an appreciable extent the capacity, weight, and loading dimensions of the 23-ton wagon. The commissioners will consequently be enabled to carry out the necessary alterations to their staithes, etc., for the reception of high capacity wagons.

An Engineer's Dictionary.

At the forty-sixth general meeting of the Society of German Engineers, at Magdeburg, Dr. Peters, of Berlin, mentioned that the "Technolexicon," after many years' preparation is now approaching completion. It is being compiled under the direction of Dr. Hubert Jansen, of Berlin, and will be published in German, French, and English. The work has advanced so far that the arranging of the words has begun. Up to now 2,700,000 word-cards have been collected. To these will be added the 100,000 of cards that will result from the working out of the original contributions not yet taken in hand. Arrangements have been made with scientific and technical societies regarding the correct spelling of foreign words used in German technical literature.

Masons Gas Power Company, Ltd.

Masons Gas Power Company, Ltd., of Alma Works, Levenshulme, Manchester, have acquired from Messrs. W. F. Mason, Ltd., that portion of their business which relates to the manufacture and sale of gas producer plant for power and furnace work, gas furnaces, etc., together with all their patent rights and licences in the same, and the above-mentioned works. The chairman of Mason's Gas Power Company, Ltd., will be Mr. William Beardmore (Messrs. William Beardmore and Company, Ltd., Parkhead, Glasgow). Messrs. Mason have arranged with the new company for the necessary accommodation for the other branch of their business pending their completion of their new works.

The late Sir Jacob Wilson, so long connected with the Royal Agricultural Show, undertook the management of the recent exhibition, and it is thought that the overwork and worry connected with the attempt to make Park Royal a success contributed not a little to his unexpected demise. Sir Jacob was for many years agricultural adviser to the Board of Agriculture.

A Continuous Photo-Copying Machine.

The illustration page 177 shows the continuous photo-copying machine which Messrs. J. Halden and Co. have just perfected. As it is capable of dealing with tracings 50 or 100 yards long or a combination of tracings lightly joined to each other, it is likely to play a very important part in engineering photography. Inclusive of the arc lamps the height of the apparatus does not exceed 4 ft., and it can be readily worked by a junior. The operation of the machine is briefly as follows. The operator winds on to a loose spindle the tracing to be copied, the spindle thus filled being replaced in its forks. The sensitised (or photo) paper spindle is run through the roll, and in its turn placed in its forks on the table of the machine. The operator now draws the end (or edge) of the tracing on to the end (or edge) of the photo paper, guiding the two combined to the contact rollers, when he starts the motor which propels the machine. At this point the arc lamps are switched on. The tracing with the photo paper behind may now be discerned passing almost imperceptibly between the flat glass plate and the contact rollers, the latter being so constructed as to give an undeviating pressure at all times, and the papers are drawn in by the upper contact roller. The speed at which rapid ferro paper receives the correct exposure is one minute per foot lineal of paper, regardless of width, with 200 voltage.

As the tracing and exposed photo paper come free from the contact plate and rollers, they are guided to separate rollers, winding up automatically until the whole length placed on the feeding spindles, has passed the contact plate. The arc lamp and motor are then switched off, the photo print being carried away for development, and the tracing removed from the other spindle.

If it is desired to make prints from a number of small tracings of varying size, they are fed by hand on to the photo paper as it travels to the contact rollers, and having passed between them and the contact plate, they drop into a tray, and can be fed again in the first order repeatedly on to the photo paper, until the whole number of prints required has been taken.

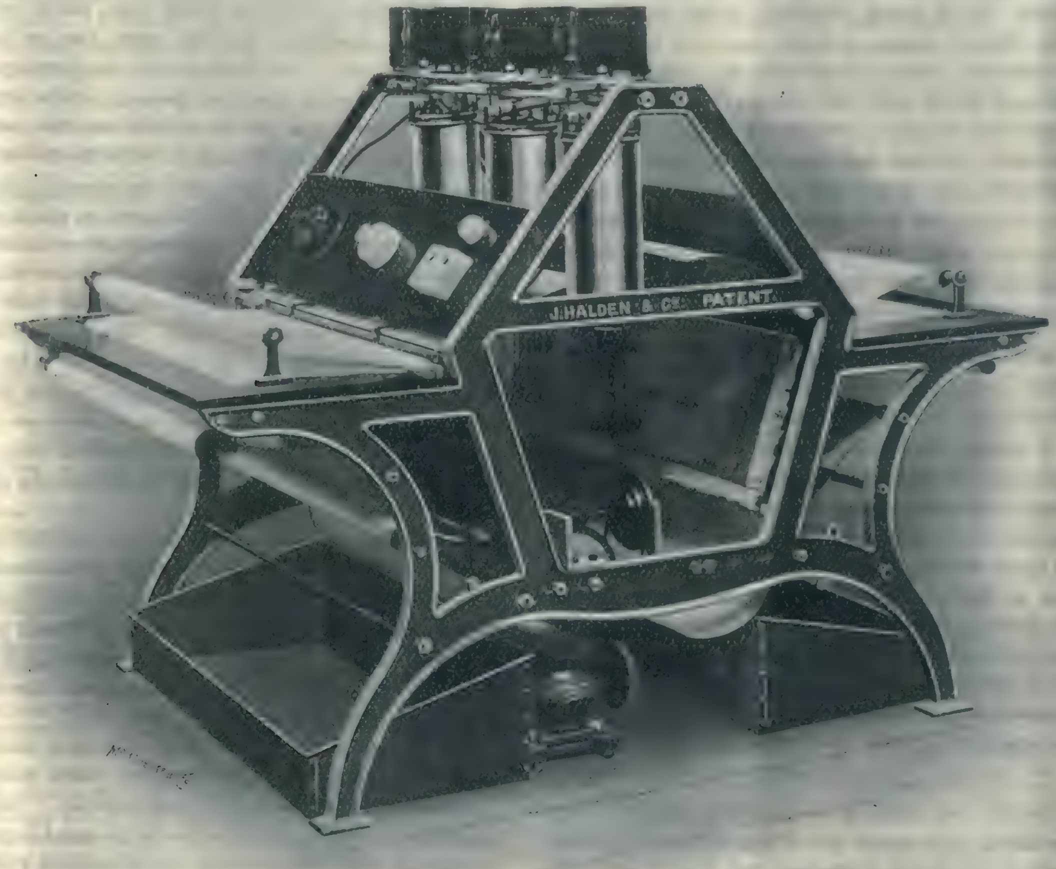
One advantage afforded by this machine is that the work of the operator is performed at "table height," and another is that it economises materials. But of course its chief claim to attention is its great capacity for turning out difficult work in the shortest possible space of time. The machine is made both in single and double form. The latter promises to be the most valuable and economical, as the one set of arc lamps is arranged in a simple manner to cause the arc light to work on two tracings and prints as they pass gently before it.

New Boiler Works of Messrs. Ruston, Proctor, and Co., Ltd.

The illustrations which appear on pages 170 and 192 are from photographs taken in the new boiler works of Ruston, Proctor and Co., Ltd., at Lincoln. The hydraulic sectional flanger (page 192) is fitted to vertical, horizontal, and holding-down rams. It works at a pressure of 60 tons and 80 tons respectively. An extension table, fitted with hinges, forms part of the machine; it can be dropped to angular positions, for flanging circular and pipe work. In the other view are shown vertical plate bending rolls, four in number, of forged steel. This machine requires 13½ h.p. driving power. It deals with plates 1¼ in. thick, and up to 8 ft. high. The floor round these rolls is of concrete, with rollers let in for the plates to slide on.

Manchester Association of Engineers.

In view of the present year approaching the Jubilee of this association, the president (Mr. Robert Matthews) invited the members and ladies to a garden party at his residence, Parr's House, Heaton Mersey, on Saturday afternoon last. Upwards of 400 members and ladies accepted the president's invitation, and spent a pleasant afternoon in the beautiful gardens. Many prominent local engineers were present, the guests including Mr. Alfred Saxon, Mr E. G. Constantine, and Mr. Henry Webb (three ex-presidents of the association) and Mr. W. Edward Storey (president of the Manchester District Engineering Trades Employers' Association). During the afternoon music was provided by the Barnes' Home Military Reed Band, and Mr. Ernest Hastings contributed a humorous and musical entertainment.



THE LATEST PHOTO-COPYING MACHINE.

This has been developed by Messrs. J. Halden and Co., for continuous photo-copying. The illustration shows the double pattern machine copying two tracings.

Ventilating Arrangements of Battleships.

This was the subject treated in a paper read by Fleet-Surgeon William Tait before the Health Congress. He made particular reference to the ventilating arrangements of the battleship *King Edward VII.*

The ventilation of this ship, as in that of the older battleships and cruisers, is both natural and artificial. The officers' mess-rooms and cabins, as well as the space inhabited by the crew, are not only ventilated by the ports and scuttles, but have in addition fresh air supplied from fans. These fans are all driven by electro-motive force; there are no steam-driven fans in the ship, not even in the engine-rooms and stokeholds. The cowls which were such a prominent feature in the older battleships have entirely disappeared, the air supply being taken from shafts, which rise only a few feet above the upper deck, and have open mouths protected only by a hood to keep out rain and spray.

There are twenty-eight centrifugal 12½-inch "sirocco" fans, eight 12½-inch axial fans, and six 5½-inch "sirocco" centrifugal fans. Besides these there are four 25-inch supply fans for the engine-room, and four 30-inch exhaust from engine-room. This large number of fans obviates the necessity of having long air trunks piercing the water-tight bulkheads. Each fan drives air directly into an air chamber, from which pipes lead to the different compartments to be ventilated. Each pipe is labelled and controlled by slide valves, as in the newer cruisers, the ventilation being on exactly the same principle.

One peculiarity in the *King Edward VII.* class that has never been attempted before in men-of-war is the heating of the air which is supplied to the living spaces in cold weather. This is effected by heaters, consisting of a nest of steam pipes heated by steam from the boilers, and through which the air is driven by the fans. Each fan drives the air directly into the heater, from which it is distributed as required. In order to prevent the heated air becoming too dry, an arrangement is fitted into the heaters whereby a fine spray of steam can be made to moisten the warm air as desired. Six axial 12½-inch fans are placed in the ammunition passages, three on each side, and two axial fans in the engineer's store-room.

Numerous portable axial fans are supplied for the officers' cabins, mess-rooms, sick-berth, and other places. The ends of the ventilating pipes are fitted with nozzles for a hose connection, so that any compartment can be ventilated through a hose if considered desirable.

Standardisation of Screens.

The Standardisation Committee of the Institution of Mining and Metallurgy is now taking definite steps in connection with the vexed question of screens, and has issued a circular to ascertain the views of members.

In referring to wire-screen mesh it seems desirable as a first step to adopt one uniform basis of measurement, and established custom would seem to justify a general agreement in using as a standard the number of holes per linear inch measuring from centre to centre of the wires. It is suggested that if a standard of equal number of holes each way be aimed at (as certainly is desirable) there is no need to describe a screen of, say, 100 mesh as a 10,000 mesh screen; and at present both descriptions are in use. While no actual confusion may result, uniformity is advantageous, and figures of mesh—with frequent use—become representative in the mind of certain mentally-recognised sizes. The smaller figures for the linear inch are one distinct advantage, and they are derived directly from a single measurement, while the larger ones are a product of calculation following measurement, and give no greater accuracy of definition.

It is generally known that the number of mesh to a linear inch does not clearly define the size of the opening. Owing to great variations in the thickness of wire in different screens, it is always necessary (if anything approaching accurate definition is required) to give either the gauge of the wire or the actual measurement of the opening between wires. From this it has been sometimes urged that the use of the number of mesh should be dropped entirely, and only measurement of openings should be given. This is logical, and would secure the exactness aimed at—but it raises several questions of a practical nature when examined as to its application. There is no difficulty in the measurements of openings in a screen down to, say 1-32 of an inch, but the important function of mesh as usually employed is in connection with openings much finer than this. The grading is necessarily done by wire screens; and if some uniformity in these can be established, comparative results are reached more readily than by attempting corrections for variation in size of opening.

It would seem desirable, states the circular issued by the committee, to retain the use of the term "mesh" of screens, on a basis of the linear inch, for grading of particles smaller than $\frac{1}{16}$ or perhaps 1-32 in. (equal to, say, eight or fourteen mesh) and to insure uniformity as far as possible by use among engineers of a standard thickness of wires.

Name of Applicant.	System (where known).	Position of Working.	Radius of Action.	Present Stage of Application.
Anglo-American Telegraph Company.	Experimental (for communication with North America). System not yet decided on.	Valentia, Ireland	About 3,000 miles	Under consideration.
De Forest Wireless Telegraph Company (American).	De Forest system:— (1) Commercial ship-and-shore communication. (2) Inland communication for Press purposes. (3) Communication with America (experimental in first instance).	(1) Numerous points on coast of Great Britain and Ireland. (2) Between London, Manchester, Liverpool, Glasgow, and Belfast. (3) Ireland or Scotland.	(1) } 50 to 400 miles, according to requirements. (2) } (3) About 3,000 miles.	(1) Refused in regard to majority of localities indicated, on ground of risk of interference with other stations; but license offered for sites in certain specified localities. (2) Further information asked for but not yet furnished by company. (3) License offered for site in Hebrides or on West Coast of Scotland.
Lloyd's	Marconi system. Ship-and-shore communication, and communication between certain islands and mainland.	Malin Head, Inishtrahull, Fastnet, St. Catherine's Point, St. Abb's Head, Tory Island, Flannan Islands, Butt of Lewis, and certain stations of the Marconi Company which, the Postmaster-General is informed, will be worked by Lloyd's, and for which a license will also be granted to the Marconi Company. Among these is Niton, but it is contemplated that if wireless telegraphy is worked at St. Catherine's Point the Niton station will be closed.	About 100 miles	License in preparation.
Lodge-Muirhead Wireless and General Telegraphy Syndicate.	Lodge-Muirhead system:— (1) Commercial ship-and-shore communication.	(1) Dover, Isle of Wight, Lizard, and Fastnet.	(1) Not specified - -	(1) Refused on ground of risk of interference with other stations, but license offered for sites in other districts.
	(2) Experimental - - -	(2) Elmer's End, Downe, Hythe, Aldershot and beyond, and Caterham.	(2) About 100 miles -	(2) License in preparation.
London, Brighton, and South Coast Railway Company.	Rochefort (for communication with Western of France Railway Company's wireless station at Dieppe, and with steamers of the two companies).	Newhaven and company's steamers -	About 60 miles -	License granted
Marconi Company	Marconi system:— (1) Commercial communication with America, and with ships at considerable distances.	(1) Poldhu or vicinity and west of Ireland.	(1) 3,000 miles and upwards.	(1) License in preparation for Poldhu, and application under consideration as regards the proposed Irish station
	(2) Commercial communication with ships at comparatively short distances.	(2) Lizard, Rosslare, Crookhaven (or Browhead), Caister, Niton, Holyhead, North Foreland, Haven, Withernsea.	(2) About 100 miles -	(2) License in preparation.
	(3) Experimental - - -	(3) Liverpool, Chelmsford, Fraserburgh. (*See also* remarks on Lloyd's application.) Also on board ships.	- - - - -	(3) Do.
Midland Railway Company	(1) Experimental (Lodge-Muirhead system). (2) Private business (Lodge-Muirhead system).	(1) Spondon, near Derby, and a movable railway van. (2) Heysham and the company's steamers.	(1) About 10 miles - (2) About 150 miles -	(1) Permission given. (2) Under consideration.
National Electric Signalling Company (American).	Experimental communication with America (Fessenden system).	Machrihanish Bay -	3,000 to 5,000 miles -	License being executed.

SOME OF THE MORE IMPORTANT APPLICATIONS DEALT WITH UNDER THE WIRELESS TELEGRAPHY ACT.

The Wireless Telegraphy Act, 1904. Three months' Working.

A return just issued relative to the working of the Wireless Telegraphy Act for the first three months of the present year includes the following figures :—

Number of messages, under the terms of the arrangement with the Marconi Company, handed by the general public to the Post Office for transmission to ships at sea, 111.

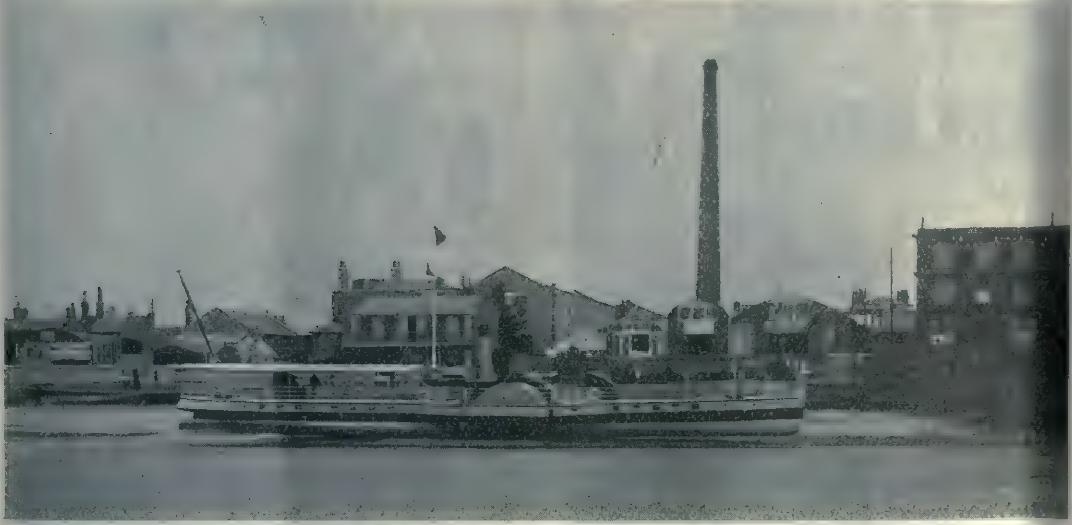
Number of messages received from ships at sea and delivered by the Post Office to the general public (including messages transmitted by the Post Office to places abroad), 1,655.

The return shows that seventy-three licenses were applied for under the Wireless Telegraphy Act, 1904, and in forty-eight cases permission has been given or is about to be given. Ten applications are still under consideration. One application was refused, one "partly refused," and in four cases of refusal alternative sites were offered. An application by the General International Wireless Telegraph and Telephone Company, Ltd. (Orling Armstrong System) for permission to work between Walters Ash, Bucks, and other stations in that county, and between Moorgate Street and other stations in London was refused on the ground that "installations are designed for the purpose of establishing exchanges which would be in contravention of the Postmaster-General's ordinary telegraphic monopoly." Another refusal was in the case of Mr. C. E. Kelway, whose application referred to experimental apparatus at Dover (radius fifteen miles) in connection with his sound-locating system for ascertaining the position of ships. In this case the license was refused on the ground of risk of interference with other stations, but the license was offered for some other locality where this difficulty would not arise.

Many of the applications refer to apparatus of a purely experimental character. The more important details furnished by the return are included in the tabulation on the preceding page.

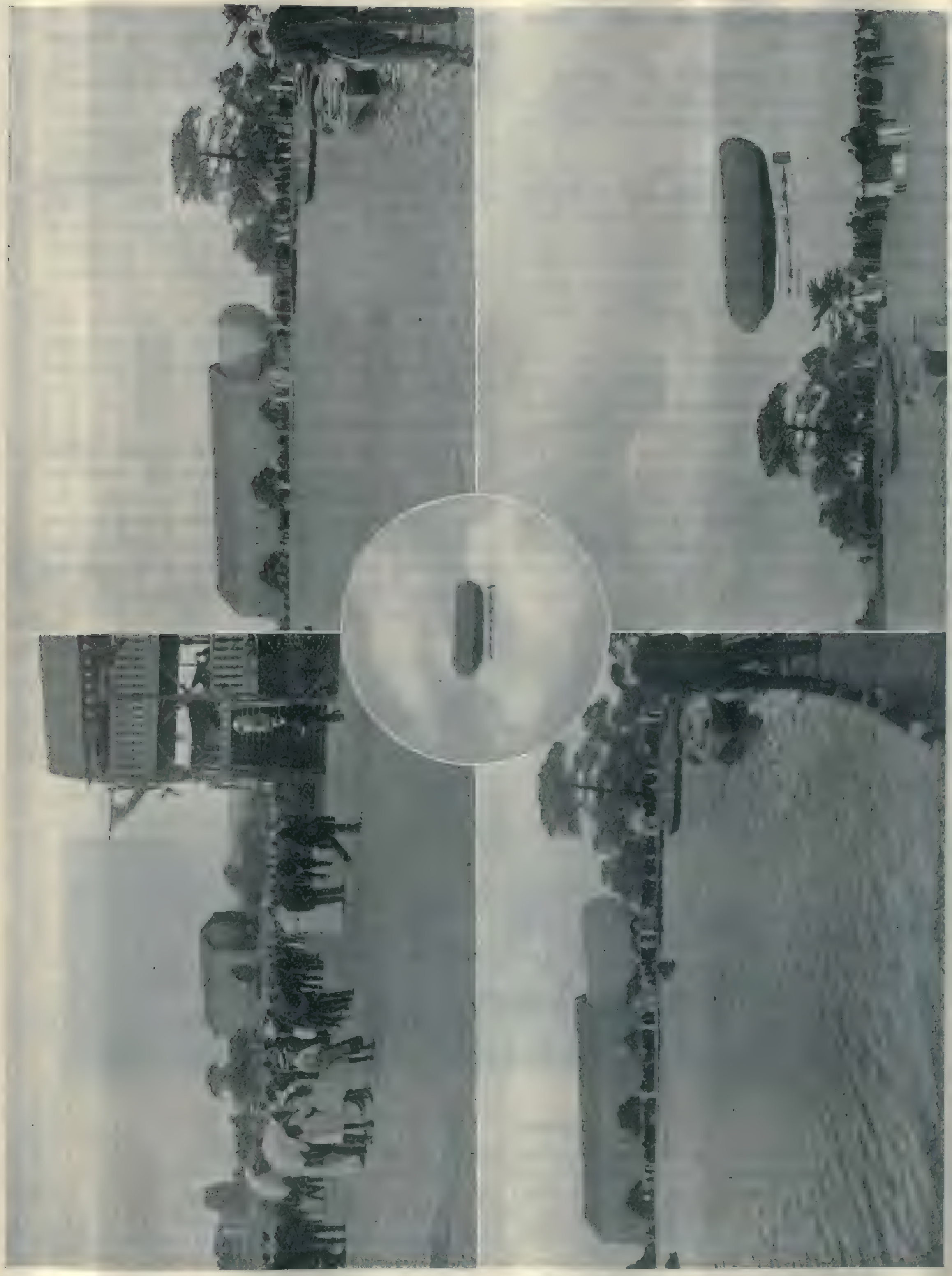
Wrexham Destructor.

Wrexham has again demonstrated that the combination of refuse destructors with electricity works can, under able management, be worked successfully. Mr. Sillery, the electrical engineer, reported on June 7th to his committee that the Meldrum Destructor had worked continuously for twelve months without stoppages and without incurring a cost of one penny for repairs.



A STRANDED L.C.C. STEAMER.

The above photo has an exceptional interest in view of the correspondence which has been appearing in the press upon the subject of the alleged instability and weakness of the L.C.C. Thames steamboats. It shows one of the Thornycroft-built boats, which recently grounded, and was left by the tide on the mud at Hammersmith. It will be observed that daylight can be distinctly seen under the keel of the boat for about a third of its length, at each end, leaving the boat supported only in the centre. That the boat remained in this position for a whole tide without developing any sign of strain says something, at any rate, for the strength of these vessels.



THE ASCENT OF THE BARTON-RAWSON AIRSHIP FROM THE GROUNDS OF THE ALEXANDRA PALACE ON SATURDAY.

From photos specially taken for PAGE'S WEEKLY.

THE BARTON-RAWSON AIRSHIP.

THE Barton-Rawson airship has already been described in our columns, and we have to congratulate Dr. Barton and Mr. F. L. Rawson on bringing the invention to maturity after some very trying yet unavoidable difficulties, one of which, as our readers will remember, involved Dr. Barton in a painful accident.

The ship duly made its first public ascent last Saturday from the grounds of the Alexandra Palace, but it was soon seen that she was unable to make headway against the wind, which was blowing up from the south-west at a velocity of about 23 miles an hour, and she drifted away to the east, finally being brought to earth at Romford. Within a few minutes of starting, and whilst her nose was still in the wind, the airship appeared to be standing quite still, proving that she was developing a speed equal in a calm to twenty-three miles an hour.

The balloon was composed entirely of silk, being 180 ft. long and 40 ft. in diameter, and holding 200,000 cubic feet of hydrogen gas. Two 50-h.p. Buchet motors were employed to drive four 7-ft. propellers at about 1,000 revolutions per minute. The ship was steered by means of a rudder, movable aeroplanes in front of the motors causing it to rise or fall.

The views which appear on page 180 were specially taken for PAGE'S WEEKLY, and show the airship being removed from the shed and its graceful ascent.

The descent was made in the grounds of Heaton Grange, near Romford, where a garden party was in progress. The ship is described as sinking to the earth without a tremor on a perfectly even keel. A Daily News representative, who contrived to witness the descent, describes the critical moment which followed: Two of the passengers in a moment of forgetfulness joined Dr. Barton in the bow of the airship, where the latter was busy receiving the congratulations of the garden party. This sudden shifting of the weight upset the equilibrium, and the stern of the airship rapidly rose in the air, the gas in the ballonet rushing aft the more she inclined upward. In another three seconds she would have been standing on end, when the gas would, in all probability, have blown the end of the balloon off and sent 14,000 lb. of hull and machinery toppling over amongst the crowd. With a presence of mind deserving of great commendation, Mr. Harry Spencer, who remained in the stern, grasped the "ripping gear" with which the ship was fitted and tore the balloon open from end to end. To the airship the fall was disastrous. What had five minutes previously been a magnificent invention proudly soaring in mid-air lay a complete wreck. As the ship fell she crashed over on her side, starting the stern motor from its bearings, and smashing the starboard aft propeller off close to the boss.

In the course of an interview with the same enterprising correspondent Dr. Barton said: I am perfectly satisfied with the way the ship behaved. Personally, I do not grieve at the loss, because I should never have sailed her again. One thing the voyage proved to me—the ship was too large and the rudder was too small. Directly we ascended I realised that the wind was too much for us, and although, as you may have noticed, we for a short time held our own, we thought it advisable to make for the open country. The greatest altitude we reached was 2,400 ft., and here the carburettor of the bow engine froze up, and the motor was consequently put out of action. We had to work with one engine until we had descended into a warmer current of air.

When we passed over the East London Water Works the reservoirs so cooled the gas in the balloon that we were within 300 ft. of the water. Our trail rope, as a matter of fact, was dragged through the reservoir. I was glad when we got over this and ascended again. I am more than pleased with the way in which she behaved all through, and I think she more than complied with the War Office conditions. She carried a bigger crew than was stipulated. I proved that her aeroplanes would do all that was expected and keep her afloat without losing gas or ballast. Her speed was nearly double that demanded, whilst her turning circle was 200 yards, but I could easily reduce that radius with a larger rudder, and I think I have demonstrated that I can come to ground anywhere I like, for I selected the field in which to descend. The subsequent accident had nothing to do with the descent.

"ELECTRIC RAILWAYS."

DEVELOPMENT in electric railway traction is making rapid strides. The rate of progress is such indeed that a book on the subject quickly becomes out of date, unless frequently revised. The like fate may easily befall this work, but the authors by embodying recent advances have done their best to postpone the evil day as long as may be. The aim of the writers has been to discuss the subject from a theoretical as well as from a practical standpoint, so as to produce a book which could be used as a text in teaching, as well as a general reference book for those interested in the subjects of which it treats. Wisely enough the compilers have not attempted too much, and realising the extent of the traction field, and the great demand for information concerning rolling stock, have restricted the volume to that part of the subject.

The early chapters deal with the theory of the subject. The Keiley recorder, the Sheldon accelerometer, and the G.E. recording ammeter are described and illustrated. Reference is made to the tests made by Mr. Bion T. Arnold, in studying the conditions of operation on the New York Central, and instituting a comparison between steam and electric traction. The results recorded in favour of electric traction, although comparatively recent, are now quite familiar, and were, it will be remembered, published by Mr. Porter and Mr. Arnold in the Transactions of the American Institution of Electrica Engineers.

An interesting chapter is devoted to a consideration of the direct-current series motors, and a special type of gearless motor in use on the New York Central is illustrated and described. A high efficiency is claimed for the motor, due to the elimination of gear losses. The motors in question are each of 550 h.p., and capable of operating up to a speed of 75 miles per hour. The importance of the alternating current single-phase motor in connection with long distance railway traffic is, of course, recognised, and is accorded a special chapter. One knows that it is all a question of finance. The direct-current system involved too great an expense for successful operation, and engineers were put upon their mettle. The thing simply had

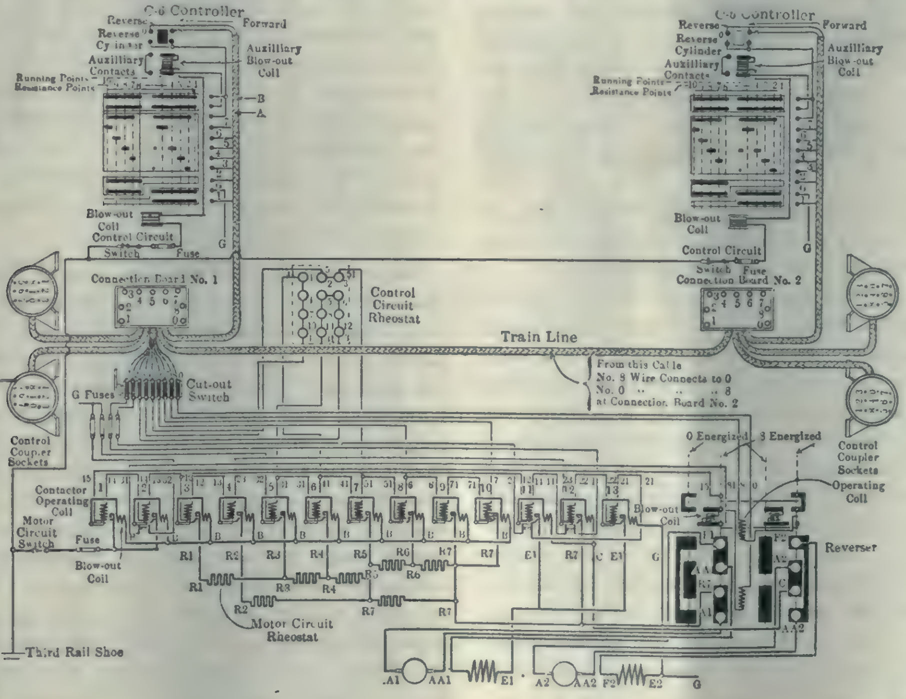


FIG. I. DIAGRAM OF CIRCUITS, TYPE M CONTROL.

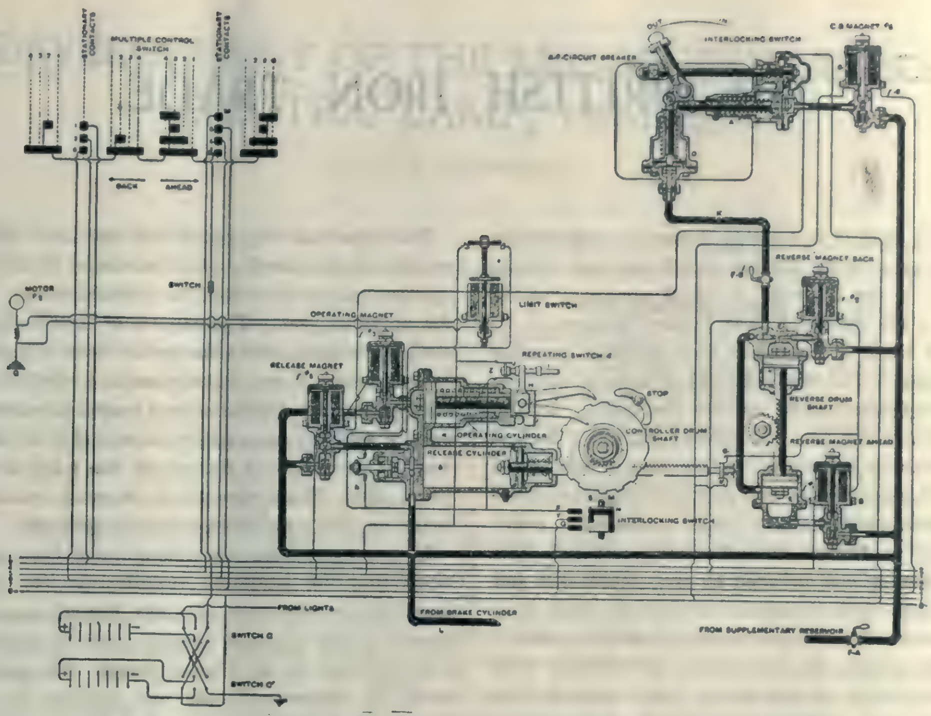


FIG. 2. WIRING DIAGRAM OF WESTINGHOUSE PNEUMATIC CONTROL.

to be done. The production of a system embodying the advantages of alternating current for power transmission, the current to be applied direct to the motors, was not quite an easy problem. American engineers therefore devoted themselves to the development of a single-phase railway motor, and the process of evolution is traced through its several stages. In a subsequent chapter, types of control, both "hand" and "automatic," are dealt with in some detail, and in fig. 1 the G.E. type M. control is illustrated. This is in use on the New York City service, and it will be remembered is equipped with a device for providing automatic acceleration. The contactor type M. consists of a magnet energised by a small live current passing through the controller and the control circuit rheostats. When energised, the contactor attracts a pivoted metallic finger closing the main line motor circuit, so that current from the third rail may enter the rheostats to the motors (fig. 1). With each contactor is associated a magnetic blow-out coil. The contactor system is obviously superior to the sliding contact method.

The Westinghouse multiple train control, illustrated in fig. 2, consists primarily as readers are aware, of the use of compressed air to move the controlling apparatus. The system is similar to the series multiple type of control, employing the same method for resistance manipulation as provided for by they standard hand control. With the Westinghouse system air is admitted to cylinders by electro-magnetic valves, and it really embodies a combination of two multiple control switches. Other types of control are also described.

The second half of the book deals with rolling stock. It is curious in this to note how a policy of conservatism has prevailed. Just as railway carriages evolved out of the old stage coaches, so have the car bodies used in electric railway service been created from the bodies used in horse-car service, and still show distinct signs of their origin. However, the authors refer to some novel types of car now in use. Attention is also directed to the important question of car weights, for in the case of electric traction the effect of weights on operating cost is immediately apparent. An interesting chapter treats of brakes and braking, both theory and practice being discussed at some length. The recently-developed electro-magnetic brake, in which the track rails form part of the magnetic circuit is illustrated, but the space devoted to electric locomotives is mainly descriptive. The final chapter deals with electrical measurements. On the whole the authors have done their work well.

"Electric Railways," Theoretically and Practically Treated by Sidney W. Ashe and J. D. Keiley. New York: D. Van Nostrand and Co. London: Archibald Constable and Co., Ltd.

THE BRITISH IRON TRADE.

A GOOD deal of interesting matter is contained in the report of the British Iron Trade Association, a summary of the contents of which appeared in the last issue of the Iron and Coal Trades' Review.

The iron trade of 1904 was in a position peculiar and perplexing. For the first eight months of the year there was unquestionable dulness generally. During this period both imports and exports showed a decline in many leading categories, prices had a downward tendency, competition on the part of foreign countries was extraordinarily active and persistent, every market held by British manufacturers, and not least the home market, was invaded by rival merchants and manufacturers with a degree of strenuousness and success that has hardly been equalled at any previous period. Altogether, the conditions of business were neither comfortable nor reassuring. And yet it may be said that the more general aspects of the trade of 1904 could hardly be regarded as unsatisfactory except in a relative degree.

The imports of iron ore were rather under those of 1903, but in the first five months of 1905 the ground lost was fully recovered. Slightly over 30 per cent, of the total iron ore consumption was imported, and of the total imports 80 per cent. was drawn from Spain. The United States was a keen competitor of Great Britain, and the most notable instance of success in this direction was the supply of 216,801 tons of rails to Canada, against 39,739 tons supplied by Great Britain. The reduction of shipbuilding costs in the early part of the year 1904 was considerable, and it is computed that a 7,000-ton steamer could be built for about £39,000, compared with £60,000 three years earlier. At the beginning of the present year there were in the United Kingdom 1,049,860 tons of iron and steel vessels under construction, against 898,478 tons a year before. American ships, it is generally acknowledged, cannot at present be built within much less than 40 per cent. of the cost of those built in England, and in this connection the benefits conferred on British shipowners by the practice on the part of protected American steel makers of selling cheap steel plates to England should be noted.

That is one aspect of the position, but the increase of 815,010 tons in American exports of iron and steel, and a decrease in imports of 912,543 tons, reacted with considerable force on the British trade situation.

The American imports of iron and steel for the nine months ended March, 1905, amounted to 185,182 tons, against 426,530 tons for the corresponding period of the previous year. The exports of American iron and steel increased in the same period from 373,966 tons to 875,213 tons, These figures make it clear that in the later period the American iron trade had entered again upon a strongly competitive career, akin to that which was so prominent a feature of the trade some three years ago. There appears to be good reason for the belief that this competition will be continued.

In some previous years there have been apprehensions that the available supplies of iron ores, and especially of the ores of Lake Superior, would not permit of any material extension of the output of pig iron and steel in the United States. No such anxiety exists in reference to the ore supplies of 1905. A supply of 30,000,000 tons of Lake Superior ore is regarded as not improbable for the present year, and there appears to be no good reason for the belief that the iron ore resources of the United States are as yet within measurable distance of exhaustion.

The production of pig iron in February, 1905, was at the rate of 21,500,000 tons a year, the highest mark in the history of the trade, as compared with 14,200,000 tons on February 1st, 1904.

Hitherto the development of the steel industry has —at any rate for the last twenty years—fully kept pace with that of the iron industry. Official records show that in 1880 the total output of steel throughout the world was not more that 4,500,000 tons, and that this figure had in 1903 advanced to the colossal total of 35,500,000 tons. During the same interval the world's output of pig iron has increased from about 18,000,000 tons to about 46,500,000 tons. Hence, while the total make of pig iron increased about 28,500,000 tons, that of steel of all kinds had increased by 31,000,000 tons. The difference between the two sets of figures is largely due to the displacement of puddled iron by cast steel.

One of the noticeable features of the report for 1904 is the increasing tendency on the part of smaller and less populous countries to provide for a home iron industry. This movement has been either initiated or developed during 1904 in the Transvaal, Natal, New South Wales, and Queensland in our own Empire; while Chili, Brazil, and Peru appear to be competing for a pioneer iron industry in South America.

THE DEVELOPMENT OF THE EDISON INCANDESCENT ELECTRIC LAMP, 1881-1905.

BY J. T. MARSHALL.

THE writer has been continuously in the employ of the Edison General Electric Company, and its predecessors, since October, 1881. In that year there were made in the United States about 34,000 very crude-looking Edison incandescent electric lamps, the greater number of which were 16 c.p., 100 to 110 volts, and 5·8 w.p.c., or eight lamps per horse-power. Their average life to the breaking point was about 3,000 hours, but they declined so rapidly in candle-power as to be very inefficient long before they broke. Lamps then sold for 65c. apiece, but the cost was more than double this, so that they were manufactured at a loss.

In 1904, there were made in the United States over 45,000,000 Edison incandescent electric lamps, of artistic appearance, the greater number of which were 16 c.p. 100 to 120 volts, and 3·1 w.p.c. or fifteen lamps to the horse-power. The average life to the breaking point of lamps as now manufactured is 800 hours, and until the end of their life the candle-power is very much better maintained that it was in the 1881 lamp at 5·8 w.p.c. If the present lamps were to be burned at 5·8 w.p.c., or at the efficiency at which the old lamps were burned, the life would be 25,000 hours, or over eight times as long as that of the old lamp. Lamps are now sold for an average of 16c. apiece. The number of lamps now made per operator in the company's factory is several times the number made per operator in 1881. It is the writer's object to trace out the development of the lamp to its present stage so as to show what has brought about the improvement in quality and appearance, and the decrease in cost.

For purposes of comparison, only the 16 c.p., 100 to 120 volt typical lamp of its time will be considered. In 1881, the Edison lamp consisted of a conducting filament of carbon enclosed in a vacuous glass globe, and connected through leading-in wires to a source of electric current, which caused the filament to glow. The component parts of the lamp were the filament of carbon, the leading-in wires to which the filament was attached, the glass stem into which the wires were sealed, the joint or clamp by which the filament was secured to the wires, the bulb into which the stem with the filament on it was sealed, and the base to which the exteror ends of the leading-in wires were attached, and which, when screwed into the socket connected the filament to the source of current.

THE EDISON LAMP OF 1905.

The Edison lamp of to-day has the same component parts; not one has been added, unless the anchor be considered an addition, nor has any one been taken away; all have been more or less modified and improved.

In fig. 1 are shown the lamp of 1881 and the lamp of 1905. A is the filament. In the old lamp it is hair-pin shaped and made from carbonised bamboo. In the new lamp it is coil-shaped, thinner, and about twice as long as in the old lamp, and is made from carbonised artificial cellulose. B shows the leading-in wires of platinum. In the old lamp they are longer than in the new lamp. C is the stem made in both lamps from a piece of glass tubing. D is the joint or clamp. In the old lamp it is made of a piece of flattened copper wire folded over the shank of the filament and copper-plated to it. In the new lamp it is made of carbon paste which cements the filament direct to the platinum wire. E is the bulb. In the old lamp it was "free blown," so that no two bulbs were the same size and shape. In the new lamp it is moulded, so that all bulbs are just alike. F is the base. In the old lamp it consists of a brass ring (a) and a screw (b) assembled and secured to the lamp with plaster of Paris. In the new lamp it consists of a cap (a) and a shell (b) assembled with molten glass

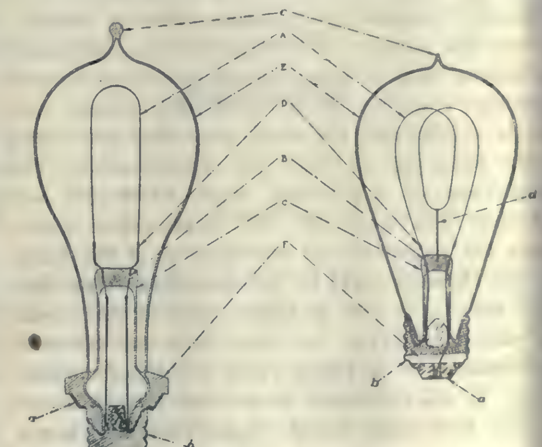


FIG. 1. THE EDISON LAMP IN 1881 AND 1905.

and secured to the lamp with a special cement; (c) is the tip left from closing the lamp after exhaustion; (d) is an iron wire support or anchor to stiffen the filament, and is the only part in the new lamp that does not appear in the old one.

THE FILAMENT.

The bamboo splint from which the filaments were cut was 11 in. long, ⅜ in. wide and about $\frac{1}{16}$ in. thick with the bark or skin on. It was submitted in turn to the operations of splitting into strips, planing off first one side and then the other, shaving off the bark, and cutting out between the shanks on the end. The work was done by hand on specially designed splitters, planes and moulds, and compared with recent methods involved an enormous amount of labour. The shank left on the end of the filament gave it a broad contact with the clamp, and prevented the heating and volatilisation of the copper-plated clamp which would otherwise have occurred. Fig. 2 shows the filament after each operation.

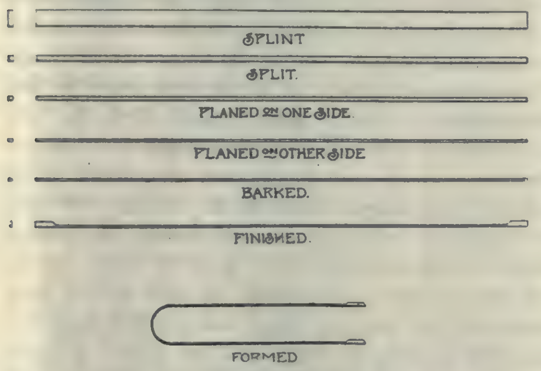


FIG. 2. DEVELOPMENT OF THE BAMBOO FILAMENT.

The shank was very objectionable. It complicated the operation of cutting the fibre, and fixed the length of the fibre so that it could not be subsequently changed to produce different candle-powers and voltage. The filaments were carbonised by heating them in forms stacked in a closed cubical plumbago crucible. At first only one filament was put in a form and the shank prevented more than a few being put in under any circumstances. The substitution of the carbon paste, which did not volatilise with heat, for the copper-plated clamp which did, permitted, the abandonment of the shank' so that filaments could be cut somewhat longer than they were to be used in lamps, more of them could be packed in forms, and they could be cut after carbonisation to the length which would give the right volts. It was customary at one time to take sample carbons from each crucible, make them into lamps, determine their voltage at 16 candles, and then cut the remainder of the filaments short enough to give their right volts. This was necessary because of the uncertainty of getting two carbonisations alike. Varying efficiencies resulted from this practice, but at that time the importance of efficiency was not appreciated as it is now. As long ago as the fall of 1881 it was realised that 5·8 watts per candle was undesirably and unnecessarily low efficiency for lamps that would burn 3,000 hours, and the standard was changed to 4⅔ watts per candle-power or ten lamps per horse-power by cutting the filaments shorter and smaller. This reduced the life.

MR. EDISON'S EXPERIMENTS.

The increase of electric lighting created a demand for lamps, that should absorb less energy and at the same time not be reduced in life. Mr. Edison set himself to working out this problem and in 1887 got out a lamp of 3·1 watts per candle or fifteen lamps per horse-power made from a bamboo filament coated with a preparation of asphalt which gave it a dense shiny surface. This made a very much better lamp. In 1892 we began to use treated bamboo filament. Treating consisted in bringing the filament to a high incandescence by means of a current while the filament was surrounded with a hydro-carbon vapour. The heat decomposed the vapour and deposited a coating of carbon on the filament. There were several distinct advantages in treating. Not only the right voltage, but also the right efficiency could be obtained from a given size filament by cutting it the right length and treating it to the right resistance, and we began to make the filaments longer and smaller. The treated bamboo filament had a longer life than the untreated bamboo filaments. The increased life was due to the fact that the character of the treated surface was such that at a given efficiency the temperature of the filament was lower.

It was not long after this that we began to use what is called the squirt filament. This is produced by dissolving cotton in zinc chloride or acetic acid, and squirting it through a small hole into alcohol or water to harden it. In this way many hundred yards of round, smooth filament of nearly uniform cross section may be squirted from the contents of a quart bottle of solution. This filament has to be washed, dried, shaped, packed in crucibles, and carbonised. The squirt method of producing filaments is so much more efficient than making them from bamboo that only between three and four per cent. as much labour is required, and very much less material. The squirt filament, besides being longer lived than the bamboo filament, has the advantage that it is possible to get it any desired length, whereas the longest possible length to get bamboo between the joints is 15 in, which will make a filament less than 12 in. long.

To get the full benefit of the treatment on a filament it is necessary that it should not be less in thickness than a well defined minimum, and this thickness can only be obtained by using filaments much smaller in cross section and much longer in length than either the treated or untreated bamboo filaments. This increased length is what makes it desirable in the latest type lamp to have an anchor to steady the filament. The treating process, of course, involves additional operations and cousequent additional expense, but the improvement in the quality more than compensates for the additional cost.

The leading-in wires are of platinum welded to copper. Platinum is used because it can be sealed into glass and make an air-tight joint. Many substitutes have been tried with some degree of success, but we have never felt that it would be safe to adopt any of them. The wires in the old lamp were ½ in. long and ·012 in. diameter, as shown in fig. 3, A, for copper clamps and B for paste clamps. They were made as long as they were to avoid having the weld between the copper and platinum put in the glass seal, and they were made as large as they were to prevent mechanical breakage of the platinum just where it entered the glass. Later the size was reduced to ·010 in. Long before the welds were put in the glass, it was repeatedly suggested that it should be done to permit the use of shorter platinum, and to transfer the strains to the copper, which was stronger. The suggestion was always met by the statement by the head glass blower: "That was tried at Menlo Park, and it caused all the glass seals to crack."

In the meantime the price of platinum was rising, and Mr. Edison set about reducing the amount of platinum. He did this, as shown in fig. 3, C, by using a piece of platinum ⅛ in. long and ·005 in. diameter, thereby reducing the amount of platinum to one-sixteenth of what had been used before. This piece of platinum was completely embedded in the glass, and copper wires protruded both into and out of the lamps, leaving four welds in the seal; just why these failed to crack the seals was never explained. The ·005 wire was large enough to carry the current, and being relieved of all mechanical strain, met all requirements. The copper wire was not found advantageous to clamp the filament to, and was abandoned as a clamp wire, after many inferior lamps had been made. The platinum wire was then run into the lamp, but the weld was kept in the seal, as shown in fig. 3, D. The amount of platinum now used in a lamp is about one-eight as much as was used in 1881.

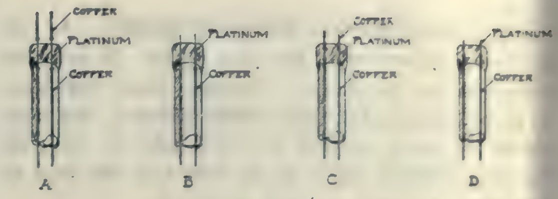


FIG. 3.

MANUFACTURING THE STEM.

Fig. 4 shows an inside part or stem in the various stages of manufacture, as it was made in 1881. A is the tubing as received from the glass factory, except that it has been cut to the proper length for four stems. B shows it with points drawn on it by heating the middle of the tube in a gas fire and stretching it out. C shows it as it appears when B is cut in two in the thin part and the open ends are melted together and drawn out. D shows two globes blown on it by heating the tubes in the proper place, and blowing it up with the breath. E shows it cut in two pieces for two stems by scouring it with a file between the globes and breaking it apart. F shows it with the wires sealed into it by heating the open ends in the fires, inserting the wires and squeezing the glass down on them with suitable tweezers.

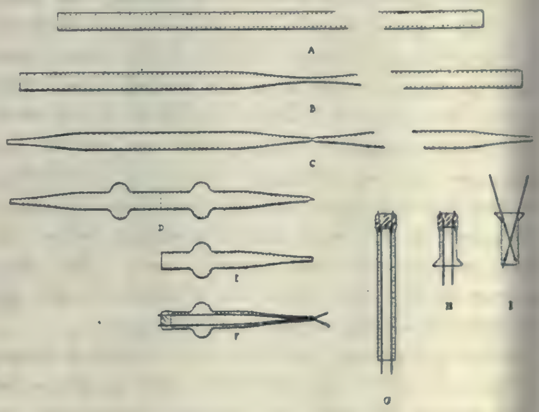


FIG. 4. EVOLUTION OF THE STEM.

Each stage was produced by a different operator except that the same operator produced stages B and C and all was hand work. The purpose of the globe blown on the stem was to make the stem fit into the bulb when the bulb was blown off and just here it will be well to consider the bulb sufficiently to show its relation to the stem.

Fig. 5 shows the free blown bulb of 1881. A, just as it was received from the glass works. B, with the tube attached to the top, through which the lamp is to be subsequently exhausted, and with the neck blown off ready to seal the stem into it. C, with the stem inserted ready to be melted to the neck of the bulb. D, with the stem melted in.

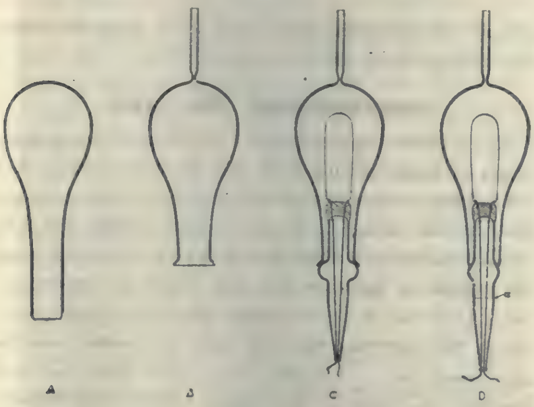


FIG. 5. FREE BLOWN BULB—1881.

To do this the operator held the top tube of the bulb in one hand and the stem in the other, and rotated them in the fires, holding the combination horizontal during the process. In melting the stem and bulb together there was a tendency for the glass to contract and thicken, so that it was blown into from the top and also from the bottom from time to time to keep it in shape. The globe on the stem was blown somewhat thinner than the rest of the stem, and this was thought to prevent a tendency to crack where the stem and bulb were joined together. That part of the stem which projected below the lamp was cut off, and thrown away. The only purpose of this waste glass was to form a handle for the operator during the process of sealing it.

The first departure from this type of stem is shown in fig. 4, G. Here the globe was omitted, and at the same time a machine was designed which held the bulb and stem in position, and rotated them in the fire while being sealed together. There was still a piece of waste glass to be cut off and thrown away, and there was a further disadvantage in this type of stem, that in melting the glass of the bulb down on the glass of the stem there were unequal strains produced, which caused a good many cracked seals. If the stem was of softer glass than the bulb, the crack took place across the joint; if the stem was of harder glass than the bulb, the crack took place along the joint. It is not easy to obtain glass always alike, so it is necessary to adapt methods suited to these variations.

Fig. 4, H, shows the stem now used. This is made from a piece of tubing cut the proper length and flared at one end. It could be sealed into the bulb on the same machine used with the previous stem, but it was necessary to have a holder to slip into the stem to take the place on the machine of that part of the stem previously thrown away. This stem had the advantage of not producing any waste glass. It has a further advantage that the per cent. of cracked seals is very much reduced, because instead of the lap-seal we have a butt-end seal. This stem was at first made by revolving a rather long piece of glass tube by hand over a pair of rollers, keeping the end of the tube in the fire. When the glass was sufficiently softened, a carbon pencil was inserted in the softened end at an angle, and the rotation of the tube produced a flare. The stem was then cut off to the proper length. This process was repeated until the tube was used up. Later the glass tube was cut into proper lengths for stems, and the pieces inserted one at a time in a little lathe-like machine which gripped and revolved the end of the tube in the fires. The flare was produced by the carbon pencil as before and then ejected.

For quite a time after the latest kind of stem was adopted the wires continued to be sealed into the stem by hand with a small specially designed tool for holding the glass. Later a machine was designed to hold the glass and wires, rotating them in the fires, and squeezing the melted glass down on the wires. The relative position of the glass and wires on this machine are shown in fig. 4, I. The machine had four rotating holders, each of which could be successively revolved in four different positions; following one of the holders around in all four positions; in the first position the stem and the wires were placed on the holder; in the second position a soft flame played on the lower end of the tube to heat it slowly to prevent cracking; in the third position a sharp flame played on the lower end of the tube to thoroughly soften it, and a pair of pincers squeezed the glass on the wires. In the fourth position the finished stem was unloaded from the holder. This machine increased the output of an operator, and had the further advantage of bringing the end of the platinum wires up against a stop, so that both wires protruded an equal amount beyond the end of the glass. This was one of the factors which entered into the problem of shortening up the platinum wire.

(*To be continued.*)

Read before the Franklin Institute.

OPENINGS FOR TRADE ABROAD.

China.

The Colombo Observer calls the attention of British manufacturers of tea machinery to the probable increased market that may be opened up for their goods in the Far East.

Spain.

Tenders will be opened on 29th inst. at the "Casas Capitulares" Calanas, Huelva, for the public lighting of that town by means of electricity during a period of ten years, commencing January 1st, 1906, at the upset price of £132 per annum. One hundred lamps, of ten candle-power, will be required. A deposit of £6 is required to qualify any tender.

United States.

Sealed tenders, in triplicate, will be received at the office of the General Purchasing Officer, Isthmian Canal Commission, Washington, D.C., until 31st inst., for furnishing air compressors, pneumatic hammers, drills and boring machines, marine boilers, rubber hose, sheet iron, steel rivets, salinometers, and salinometer pots. Specifications, forms of tender, and full information may be obtained from the office of the General Publishing Officer at Washington.

Russia.

A Consular report states that the sea canal from Cronstadt to St. Petersburg is to be deepened to 28 feet and quays are to be built from the mouth of Ekaterinhof rivulet to the entrance of the canal. Surveys have been made for a canal to unite the White Sea and the Baltic by way of lakes Onega, Sego and Vogo along the river Vyga to its mouth at the roadstead of Soroki, on the Gulf of Onega; the length of canal would be about 47 miles, but to give access to the ocean it is proposed to make a railway and a further canal to the harbour of Ekaterininsk.

Netherlands—Curacoa.

H. M. Consul at Curacoa is of opinion that an enterprising promoter might find it possible to form a company to build a dock there, as the island's importance will be immeasurably increased by the building of the Isthmian Canal. Anyone willing to establish electric, steam or automobile tramway service, and fulfil Government requirements, will meet with no competition if arrangements can be entered into with the proprietor of the present line of tramcars drawn by mules, who, says the Consul, will be unable to retain the new concession if he fails to adapt the present antiquated service to steam or to some other modern mode of conveyance.

CORRESPONDENCE.

OUR NEW PATENT LAW.

77, Chancery Lane,
London, W.C.

To the Editor of Page's Weekly.

Sir,—With the beginning of this year a new system was inaugurated as regards the granting of patents for inventions, and it may now be considered interesting to your readers not only to know what the system involves, but also, to some extent, how it is being carried out practically, as far as one can judge from a short experience.

First, then, a greatly increased staff of examiners has been established, whose duty it is to examine the novelty of the inventions sought to be patented, when or as soon as a complete specification has been lodged by the applicant. The search as to novelty is limited to an examination of British complete patent specifications published during fifty years previous to the date of the patent application. No notice is taken of foreign patent specifications published here, or of any other publications. Why the search has been thus limited is not easily understood, except by noting that it is in keeping with our usual patchwork legislation; other smaller and poorer countries can afford to extend the search to publications of every kind, and in law a patent is damaged just as much by the publication here of a foreign patent specification as by a British. It is, moreover, the old story of saving the expense of more examiners because it is thought the correct thing to make revenue out of the Patent Office surplus, or, in reality, to tax to the utmost the inventor, although he be ever so much a public benefactor.

It is the protection of inventors by the grant of patents that, to a great extent, has made this country what it is. However, we must be thankful that a principle of examination as to novelty has been introduced, though in an incomplete manner. In another twenty years, after much talk and endless agitation and deliberation, we shall, perhaps, in this respect get as far as Germany got by one leap in 1877, or as the United States over a hundred years ago. However, our new law contains a new and very valuable feature beyond the law of any other country inasmuch as the Patent Office has no power to refuse a patent for want of novelty so long as the complete specification embodies an acknowledgment or reference, in some form or other, to what was described in the specification or specifications that were held more or less to anticipate the invention as described in the first instance.

The difference between what was held to be old and what was held to be new may, though apparently slight, in course of time prove to carry with it practical or commercial advantages, which are not always so apparent at the outset as later on, when they have been verified by actual experience, and the public as well as the patentee will then be able to derive benefit from it. In Germany and some other countries the Patent Office examiners have the power to refuse a patent if they think that the novelty or originality of the invention is not *sufficiently* great to be appreciated as such, and many and grievous are the cases where inventors have on such a vague ground been denied their rights in those countries, and even sometimes in the United States, where a more liberal spirit generally prevails. We may thus be assured of better things here. A great deal no doubt will depend upon the skill of the patent agent and the common-sense of the examiners, in order that the claims may at the outset receive a clearer form and interpretation than heretofore and so as to give a patent on the face of it a truer value.

But the expense of securing a patent has been increased by £1, and the new system will in some cases involve more work for the patent agent, which will also tend to increase the cost. It is a very great pity that the annual fees which are payable every year beginning at the fourth were not lowered at the same time. They are too high for most patentees, and patents for valuable inventions are often allowed to drop because the patentee, having already spent much in bringing the thing out so far, has no more money left. It might be said that the public at large will then be able to work the invention for nothing, but over two hundred years of experience has taught us that what is everybody's business is nobody's business, and that there is no incentive for taking up a lapsed patent. I would propose that the tax payments now due at the end of the fifth, seventh, ninth, and eleventh years should be done away with. Even if the Patent Office did not under such circumstances leave much of a surplus, or not even quite pay for itself, it is of far greater importance that invention should be helped and not killed; but with the Treasury it is the old story of killing the goose that lays the golden eggs.

As regards the term of years, I am of opinion that fourteen years in a great many cases is not enough, and that it should be at least sixteen. To make the term vary according to the importance of the invention, as has sometimes been proposed, is an unworkable thing, as no capable tribunal can be imagined for deciding it. But I believe in periodical taxes in the manner I have indicated, and not in the American system, by which no taxes are paid except the initial ones at the time of application and at the date of grant. Only let the taxes be reasonable in amount or payable at reasonably long intervals.

By the German Patent Law of 1877 the principle was laid down that no patent should cover more than one invention, and this principle is carried out to the most rigid extent, so that, for instance, an improved machine which owes its improved effect to two or more distinctly separate features requires to be protected by as many separate patents, it being held that the "unity" of the invention requires a pedantic adherence to the principle. But in practice this does not work well, and in this country, and to a very great extent also in the United States, the term of "one invention" has ever been held, if need be, to cover more than one distinctive feature, so long as the several features contribute to the same end. Any one of them might, for instance, be applicable to other machines *of the kind* (but not of every kind), and separate "claims" in the specification were hence allowable for their application in the sense named. The German interpretation of what constitutes one invention has, unfortunately, been imitated in nearly all those countries which since 1877 have introduced an official examination of novelty.

It was, therefore, of great importance that this interpretation should be, as heretofore, kept out of our patent practice when the official examination was introduced. I may say that the Patent Office does not seem to wish to alter the principle of interpretation, but merely to carry it out in a more uniform manner than heretofore.

Another novelty coming in with our new practice is that the claims are required to be limited to the smallest possible number, and that the claims should be succinct and clear, while the whole specification shall distinctly distinguish between what the examiners have proved to be old and what constitutes the distinctly new features. No objection can be taken to this so long as the matter is handled intelligently by the examiners, and the inventors' interests are duly safeguarded by an able patent agent. As far as can be judged, the new system is a real improvement, and will, I believe, render more easy the practical introduction and working of useful patented inventions, to the great advantage of the public at large as well as that of the patentee.

Yours truly,

P. JENSEN,

Chartered Patent Agent.

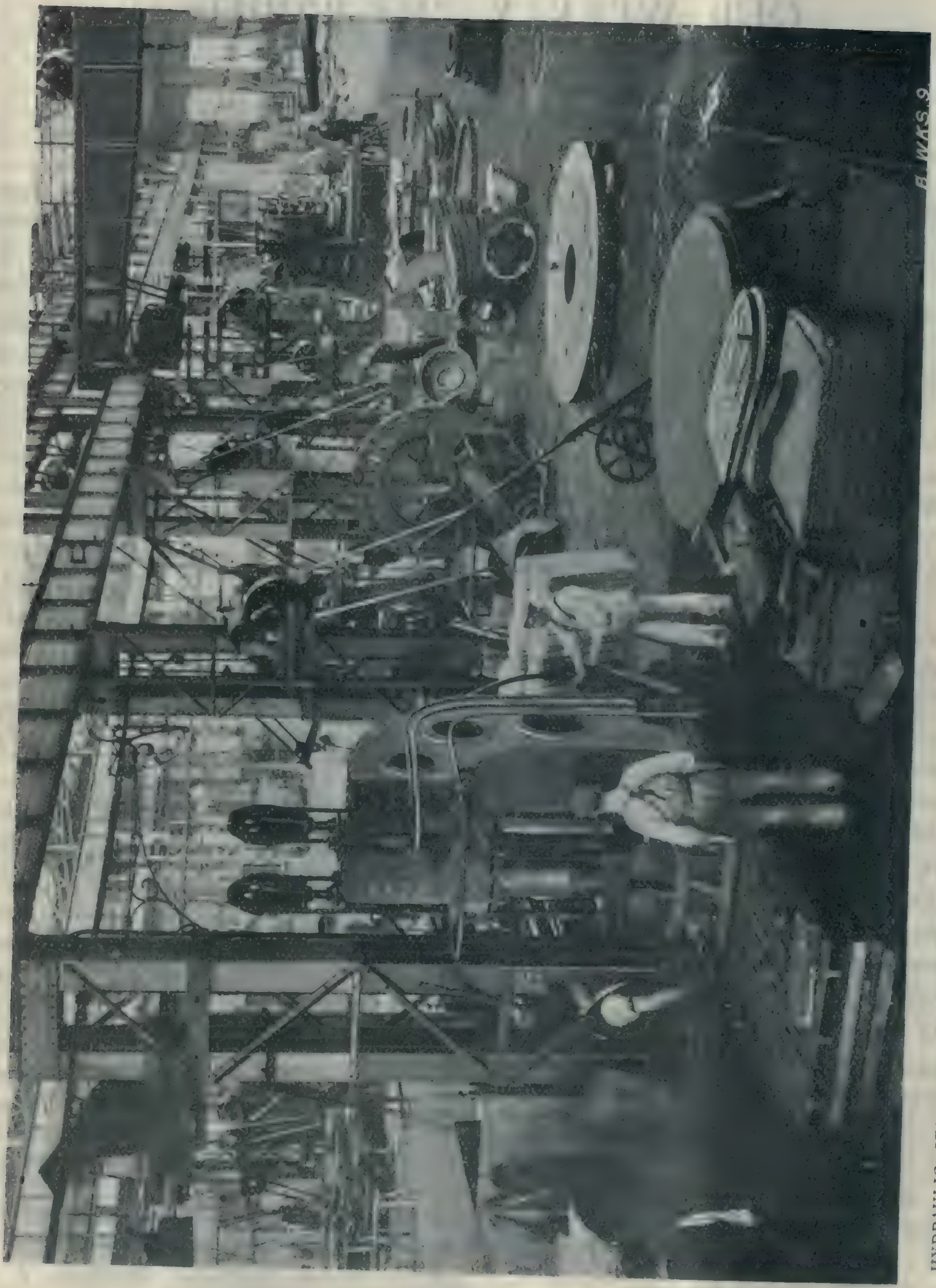
OUR WEEKLY BIOGRAPHY.

SIR MARCUS SAMUEL, D.L., J.P.

SIR MARCUS SAMUEL, President of the Institute of Marine Engineers, was born in November, 1853. He was privately educated, and at the age of sixteen entered the office of his father who was an East India merchant. He subsequently travelled very widely in the Far East and laid the foundations of business with Japan, in which country, his firm, Messrs. Samuel Samuel and Co., today occupy the foremost rank. Sir Marcus's claim to distinction rests mainly upon that widely-known enterprise, the Shell Transport and Trading Company, of which he is chairman. Not only did he pioneer the transport of petroleum in bulk through the Suez Canal, but by developing the oil fields of Borneo, he brought the question of liquid fuel into the domain of practical politics. Of almost equal importance at the present time when the motor-car and motor-boat are so much to the fore, is the fact that to Sir Marcus Samuel is due the knowledge that benzine could be safely transported in bulk. Excluded by the fears of other shipowners from bringing home Borneo benzine through the Suez Canal, Sir Marcus constructed steamers carrying 10,500 tons deadweight, and by fuelling these with oil and steaming them home viâ the Cape of Good Hope, he has rendered it commercially possible to bring to Europe Borneo and Sumatra benzine, the finest spirit the world produces, to compete with America. Without this addition to the world's supply, it is very probable that petroleum and spirit would have reached a prohibitive price, and thus precluded the development of what promised to become one of the most important manufacturing industries.

SIR MARCUS SAMUEL, D.L., J.P.

Sir Marcus served the office of Sheriff of the City of London in 1894-5, and received the honour of knighthood for services rendered to H.M.S. *Victorious* in 1898. He was Lord Mayor in 1902–3, and was created a baronet in June of the latter year. He is a Grand Officer of the Legion of Honour of France, Commander of the Order of Leopold of Belgium, and last year received the Knight Commandership of the Rising Sun of Japan, for services rendered to that country. He is a vice-president of the Society of Arts, and for three years he represented the shipowners on the Thames Conservancy. He is a director of the Alliance Marine Assurance Company, a D.L. for the City of London, a J.P. of the County of Kent.

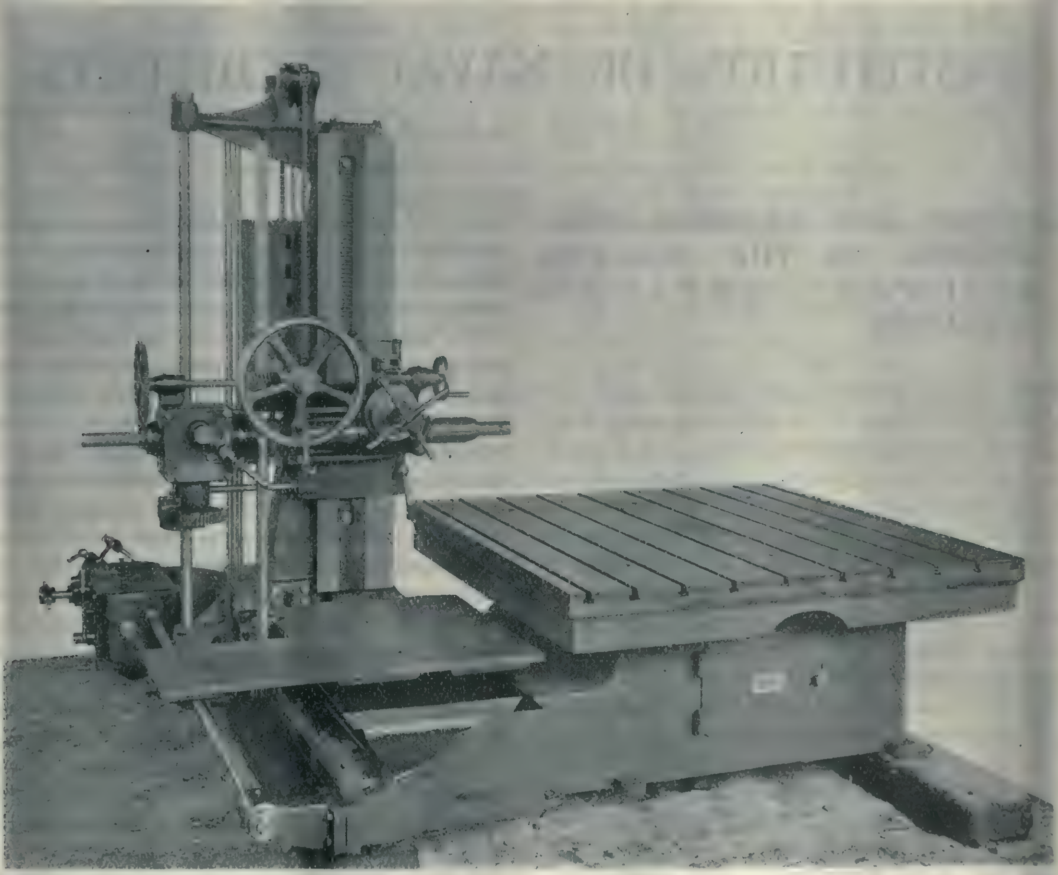


HYDRAULIC SECTIONAL FLANGER IN THE NEW BOILER WORKS OF RUSTON, PROCTOR AND COMPANY, LTD. (*See page* 176.)

AN IMPROVED HORIZONTAL DRILLING, TAPPING, AND FACING MACHINE.

BY WM. ASQUITH, LTD., HALIFAX.

THE accompanying illustration shows an improved horizontal drilling, tapping and facing machine, made by Wm. Asquith, Ltd., of Halifax. The machine is fitted with 2½ in. spindle, adjustable vertically on strong standard. The standard itself has a cross traverse by-power, with fine hand adjustment. The standard is fitted with platform to carry operator, thus enabling him to have all motions under his immediate control. The slide carrying spindle is balanced for quick and easy manipulation. The spindle can be stopped, started or reversed by clutch motion under immediate control (on slide), operated without leaving platform. The speeds are regulated by the firm's gear box, which offers the advantages of ease and facility of changing, absence of countershaft, less belting, and less initial cost of fixing than with cones. Very important in view of the development of the new steels is the constant great belt power ensured at all speeds, which, together with the other features and great strength and rigidity, enable this machine to use the new steels to the best advantage. To facilitate this, a large range of geared feeds is provided.



IMPROVED DRILLING, TAPPING, AND FACING MACHINE.

R.M.S. "INDIA."

It was in the saloon of this vessel that the members of the Institution of Naval Architects lunched on Thursday last, by invitation of the Chairman and Directors of the P. and O. Steamship Company.

INSTITUTION OF NAVAL ARCHITECTS.

(Continued from page 146.)

TURBINES AND RECIPROCATING ENGINES IN THE MIDLAND RAILWAY COMPANY'S STEAMERS.

THE statistics quoted in our last issue point to a marked decrease in the coal consumption of the *Manxman*, as compared with the *Antrim* and *Donegal*. The *Manxman* did 20.3 knots for the same coal consumption that the *Antrim* had at 19.5 knots. A similar comparison of the *Manxman* with the *Donegal* gives the same result.

The performances of the *Londonderry* are nearly as efficient as those of the *Antrim*, but they are better than those of the *Donegal*.

They also indicate that the *Manxman*, with higher steam pressure, a smaller number of revolutions, and larger propellers, has done better than the *Londonderry*.

A further economy in the turbine steamers is effected in the amount of oil used for lubrication. The logs show that this amounts in both steamers to five gallons per single trip. This, again, permits of a further economy in the reduction of the engine-room staff from four greasers to two. Speaking generally, therefore, the performances of the turbine steamers, especially the *Manxman*, have been greatly superior to those of the steamers fitted with reciprocating engines.

The only real inferiority in the *Londonderry* and *Manxman* is the difficulty of manœuvring from rest in narrow waters. In this respect they compare unfavourably with the *Antrim* and *Donegal*. No doubt with further experience those in charge will become more expert in working with the small screws, but for turning from rest there is smaller power in the side propellers. Experiments were made at the trial trips that showed the turbine steamers going full speed could be brought to rest in about a minute and a half This is a good result, but actual experience has shown the relative inadequacy of the backing power starting from rest. There is no good reason why sufficient backing power cannot be obtained with small screws if the reversing turbines are made powerful enough.

The weight of engines, shafting, and propellers in the *Antrim* and *Donegal* was 280 tons. The weight of the corresponding items in the *Manxman* was 195 tons, so that the total weight to be propelled is about 115 tons less, a difference of nearly 6 per cent. on the light weight of the steamer

For a speed of 19·5 knots the *Antrim* requires 38·6 tons of coal and the *Manxman* 35·0, a saving of 9·3 per cent. The *Donegal*, for a speed of 19·3 knots, requires 38·7 tons and the *Manxman* 35·4 tons, a saving of 8·5 per cent.

FRACTURES IN LARGE STEEL BOILER PLATES.

This subject was discussed in a paper read by Mr. J. T. Milton, Chief Engineer, Surveyor to Lloyd's Register, Vice-President. The following is a short abstract covering the points dealt with :—

The object of this paper is not only to put on record the actual research work done in the several cases, but also to elicit the opinions of engineers, and especially of expert steel makers, on the subject, so that the mistakes of the past, if mistakes have been made, may be guarded against in future, and also that the rightly-bestowed confidence in mild steel as a boiler material, instead of being lessened, may be increased. This is especially to be desired at the present time, when the use of high-tension steel is being advocated by some of our principal steel makers and engineers. In this connection it should be noted that the failures which have occurred, although this fact might have no actual bearing on the matter, have happened with steel which would be called "mild" rather than "high," that is to say, with material nearer the low limit than the high limit of tensile strength usually approved.

This paper is concerned with the somewhat rare occurrences where the failure happens in shell plates which have been subjected to no heat treatment whatever since they left the steel works.

The first case to which reference will be made occurred in February, 1900, to two boilers out of a set of four, made to one design, for a working pressure of 200 lb. per square inch. They were made by a firm of established reputation, that had already made hundreds of steel boilers. They were single-ended, and were made in two strakes of plating, the width of plate being only 5 ft. 4 in. The plates, which were 1½ in. thick, were made by a firm of the highest repute, and they were tested at the steel works by a Board of Trade Surveyor, as well as by a Surveyor to Lloyd's Register. They were bent to shape cold, in ordinary vertical rolls. Two of the boilers satisfactorily withstood the hydraulic test of 400 lb. per square inch, but in each of the other two a shell plate cracked at about 350 lb. per square inch. In one case the crack had apparently started at the manhole opening, passed through one of the manhole ring rivet holes on each side, and run nearly across the solid plate, stopping, however, at a rivet hole in the circumferential seam on each of the plate edges. The crack opened ⅜ of an inch at the edge of the manhole, showing that the rupture had freed some initial longitudinal stress in the plate, which had then shortened itself by this amount. Further, the width across the manhole opening, after the fracture, was found to be $\frac{1}{16}$ in. less on one side of the crack than on the other, showing that an initial crossways stress had been liberated by the crack of sufficient intensity to alter $\frac{1}{16}$ of an inch in a length of 12 in.

In the other boiler the crack was a short one, extending only from the manhole opening to a rivet hole of the manhole ring fastening. The length of the crack was only about 3½ in., but even in this short length it was found that the crack had relieved some internal stress, as one side was nearly $\frac{1}{100}$ of an inch shorter than the other.

RESULTS OF TESTS.

Both plates were cut up for testing. The results were fairly similar in each case. Tests made at the boiler works gave results lengthwise of the plate ranging from 26·9 to 27·7 tons per square inch, with extensions from 28·2 to 18 per cent. Crosswise tests ranged from 25·5 to 28 tons, extension from 18 to 8 per cent. The samples giving the low extension broke with a crystalline fracture showing a somewhat whiter colour in the centre of the test pieces. Twelve cold bend tests were made, much closer at the bend than the rule requirements, without any sign of fracture. These tests were corroborated by six further tensile and three bend tests made at the steel works after the plates were returned to them, the results ranging from 27·3 to 29·5 tons, extension from 26·5 to 10 per cent.

The presence of the white line in the fracture of the test pieces which gave the unsatisfactory extension indicated segregation in the steel. Analyses showed that some segregation had taken place, notably of the phosphorus and carbon.

The next case to be noticed, owing to its similarity to the last, is that of one boiler out of a set. This burst during test in November, 1903. This boiler was 14 ft. diameter, 12 ft. 9 in. long; the shell plates were 1 $\frac{9}{64}$ in. thick, worked in one strake. The intended working pressure was 180 lb. per square inch.

At a preliminary testing by the makers one of the shell plates ruptured almost its whole width at a pressure of 360 lb. per square inch; it remained intact at the two sides between the edges and the adjacent rivet holes. Here, again, the fracture was mainly through the solid plate. It passed through three rivet holes of the manhole strengthening ring, avoiding the large manhole opening itself, and extended, as above stated, very nearly to the edges of the plate. Careful measurements showed that the plate, after the rupture, had shortened $\frac{3}{32}$ in. at its middle portion, as compared with the edges. The original tests of the plate gave the tensile strength as 29·2 tons per square inch, and an extension of 29 per cent. in 8 in. Several test pieces were cut from the fractured plate. Sixteen tensile tests, some lengthwise and some crosswise, gave results varying from 28·1 tons per square inch with 28 per cent. elongation, to 30 tons per square inch with 27 per cent. elongation. Bends made from the already strained, broken tensile test pieces gave satisfactory results in 14 out of the 16 cases, and four bend tests taken directly from the fractured plate were all satisfactory.

From the results of the experience in another case, presently to be referred to, a portion of the plate, 3 ft. 6 in. long, and the whole width of the plate, was first straightened in the hydraulic press, and then bent the reverse way without showing any sign of distress. A piece of the broken plate was selected by Professor Arnold, and subjected by him to the special tests he had devised in connection with another investigation. These tests were satisfactory. In this case there was apparently no abnormality of any kind discoverable by any test, except the shortening of the plate after rupture.

AMERICAN AND BRITISH STEEL.

The next case to be referred to occurred in February, 1904. Here also the boiler was made and the plates manufactured by firms of established reputation. The boiler was 13 ft. 6 in. external diameter, the plates were 1⅛ in. thick. A hydraulic test to 360 lb. per square inch was made with apparently satisfactory results, but after the test, whilst the mountings were being fitted, a crack 18 in. long was observed running longitudinally, extending from about 1 ft. to about 2 ft. 6 in. from the plate edge. A hole drilled in the plate at the crack showed that the crack was about ⅜ in. deep. In this case the crack was through an absolutely unperforated part of the plate, and not near either the manhole or the longitudinal seam. If the flaw had been on the other side of the plate, so as to have been on the inside instead of outside the boiler, it might not have been discovered before the boiler was put to work, and the consequences might have been most serious.

Another case has recently occurred in which two cracks have been discovered in one plate, this time before testing. Here again both cracks were far removed from rivet holes, and fortunately they were on the outside of the plate. The last case to be referred to occurred in March, 1902. In this case the steel was manufactured and the boiler made in America, both of the firms concerned being of good reputation and having modern appliances. The boiler was made under the inspection of a Government Surveyor, as well as of a Surveyor to Lloyd's Register The steel was made by the basic open-hearth process, that of all the cases previously mentioned being made by the acid open-hearth system. The boiler was single-ended, 11 ft. 6 in. diameter, 13 ft. long; the plates were 1 in. thick, and were arranged in two strakes. When tested at the steel works the material showed a strength ranging from 28·3 to 28·6 tons per square inch, the extension was 25 per cent. in 8 in., and the contraction of area recorded was 51·8 and 50·6 per cent. The plates were bent cold in rolls. The rivet holes were all drilled after bending. The Government rules which had to be complied with required a hydraulic test of 1½ times the working pressure. This was satisfactorily made, and the boiler was passed by the Government Surveyor. On preparing for a test of 300 lb. per square inch, to meet the rules of Lloyd's Register, the boiler gave out by rupturing nearly from end to end at a pressure of 270 lb. per square inch.

PROFESSOR ARNOLD'S REPORT.

The broken plates were cut off the boiler, and it was found that at the lap of the inner strake of plating the plate was also cracked in two places about 4 ft. and 5 ft., respectively, from the main fracture, the cracks extending from the edge of the plate through rivet holes of the outer row to a little beyond the rivets of the second row. Attempts were made to flatten the plates under a powerful hydraulic press, but each attempt with each plate resulted in breaking the plate right across in practically straight lines, so that one plate ultimately had five and the other three fractures right across, showing that the brittleness extended over the whole extent of the plates. Many test pieces were then cut from the broken plates, and all the tensile and bent tests made were satisfactory. Amongst other tests made were some drifting tests applied to some of the rivet holes, and these were also satisfactory. Analyses of the material were made by the steel makers, and, beyond showing that in one case the carbon was higher than usual, the composition of the steel appeared to be normal and satisfactory.

The matter was referred to Professor Arnold, who, after some investigation, reported on the case.

The main conclusions are that the chemical constitution of the plate which gave the worst alternating test results was good, whilst that of the other plate, which gave satisfactory tests throughout, was also good, except that it contained too much carbon for a boiler plate; and that the defects were caused by the ingots having been overheated and rolled at too high a temperature. It may also be noted that, whilst neither chemical, microscopical, nor the ordinary mechanical tests could discover the brittleness of either plate, the fatigue tests did so in the case of one plate, but failed to do so in the other.

Later experiments have shown that when the steel is initially good, heating the ingot between wider ranges of temperature than should occur in practice with even no more than ordinary care, does not have a very prejudicial effect on either the ordinary mechanical tests or even on fatigue tests. Further, neither does overheating the finished plates seem to seriously injure them. On the contrary, in some cases it appears to have actually increased their ductility.

In view of the very large size of boiler shell plates as now made, it is important to know whether these large plates can be made free from initial strains. That large plates can be made true and free from internal stress has been demonstrated.

Seeing that large plates can be made perfectly flat and free from internal strain, it is reasonable that engineers should refuse to receive those that are rolled buckled or wavy, and should insist that in such cases the steel makers should flatten the plates by taking out the buckles or waves, and afterwards anneal the plates. Plates should always be delivered to the boilermakers in such a condition that they can use them with confidence without any preliminary straightening treatment.

THE ABNORMAL PROPERTIES OF STEEL PLATES.

Besides the bad rolling referred to, another cause of initial stresses in plates may be their unequal cooling on the mill floor. That this can occur is generally considered to be improbable, but it must be admitted that it is not impossible.

It is difficult to understand how an internal stress in a plate, even if it is sufficient to alter its length as much as $\frac{1}{16}$ of an inch per foot, as we have seen occurred in one of the cases, could materially conduce to the actual rupture of the plate, seeing that each and every part of the plate ought to be able to stretch at least 20 per cent. of its length before fracture. Professor Arnold's reports suggests two distinct causes for this, the first being that the distortion of the shearing sets up minute growing flaws, which, given sufficient time, extend from the edges into the body of the plate, the second cause being that the overheating of the ingots from which the plates were made and the prolonged cooling of the plates themselves set up a dangerous form of crystallisation, which in one of the cases appeared to be intensified in various centres. Both these causes may be closely related to what the Professor, in his conclusion No. 3, terms "cleavage" of the crystals of "ferrite." In fact, it has been shown that the actual rupture lines in mild steel mainly traverse the relatively weak "ferrits" grains. It would seem, then, that if brittleness is due to some abnormal development of cleavage planes, it would be more likely to occur, and to be more pronounced when it did occur, in the milder steel than in that containing relatively more "pearlite."

The fact that under certain obscure conditions peculiar orientation of the crystals has made an otherwise ductile plate into a brittle one is recorded in a paper by Mr. Stead, when he describes a case in which the cleavages of the whole mass appeared to be in two directions, each making an angle of 45° with the direction of rolling.

Although decisive conclusions have not been arrived at, it was thought to be advisable to put on record the work already done as a guide to future investigation, and it is hoped that bringing the known facts forward will induce other workers to take up the subject. It is earnestly desired that steel makers especially, who have such exceptional opportunities for studying all the properties of the material they make in such large quantities, will not let the matter remain where it is, but will absolutely solve the problem as to why in very rare cases some material of good sound chemical quality, made apparently in the proper way, becomes possessed of such abnormal properties as to become utterly unfit for the purpose for which it was made.

ACCIDENTS TO SUBMARINES.

At the Royal United Service Institution on June 20th, Captain R. H. Bacon, R.N., lectured on this subject. He said that, broadly speaking, there were two classes of accidents that could happen to a submarine boat—first, the admission of water into the interior, and secondly, an explosion. But the confined space and small reserve of buoyancy of the submarine boat intensified the danger of the result to the crew. In the case of the admission of water, no help could be expected from water-tight bulkheads. Water might enter the boat through a hatch or through a leak.

The former was by far the more probable cause of accident. Of the four serious accidents whereby boats had foundered in the last few years all had been due to water entering the hatch. The fact of the hatch being the main source of weakness was very suggestive and most reassuring as regards the safety of the boats, since with the practical elimination of this source of danger the main cause of accidents up to the present would be obviated. Many suggestions had been put forward for operating such a hatch automatically, but no matter required more careful consideration than suggestions for the automatic or semi-automatic closing of vital hatches.

As regards admission of water through collision, a collision of any magnitude must be a most serious matter, the reserve buoyancy in the boats being so small that even a small leak must be very difficult to deal with. It was, therefore, the natural duty of a submarine boat to get out of the way of any craft that might do her damage. There was one point, however, greatly in their favour—namely, the enormous strength of their structure compared with surface boats of similar tonnage. No increase of actual safety was obtained by small increases in the reserve of buoyancy (say) from 15 to 30 or 40 per cent., which entailed other great disadvantagess without *pro rata* gain.

MAIN CAUSES OF ACCIDENT.

Provided, therefore, that the advantage gained in safety in case of collision by small increases in the reserve of buoyancy was very slight, and that the reserve was such as to ensure seagoing safety, no object existed in reducing the efficiency of the boats from the fighting point of view by increasing the surface reserve of buoyancy unnecessarily, and so decreasing their speed when submerged. The other cause of danger—grounding—was not so very great. There were two distinct conditions; the first, merely striking the bottom, was amply provided for by practically the whole under-surface of the boats being double-bottomed, as well as by the fact of the boats being buoyant, and so very considerably reducing the effect of a grazing blow.

The other possibility was of a boat sticking its nose into the mud. The sloping nature of the under-side of the fore part of the boat did not render such an occurrence probable, unless the boat were proceeding at a very large inclination, and even then the leverage exerted in getting rid of ballast, combined with the action of the propeller going astern, should exercise great influence in freeing her.

The last possible cause of water entering was from the boat diving to too great a depth, and the hull being crushed, or some of the hull fittings being unable to stand the pressure. This argued either the failure of the diving rudders, which were made as simple and as strong as possible, and should, therefore, be above suspicion, or that too much water ballast was being carried, and, therefore, that the boat would sink from want of buoyancy.

Of all the possible causes of boats foundering from taking in water, it might be fairly claimed that the only one even probable was that when the boat was injured by collision in the hull above the centre line. Only three causes of accidents from explosions inside the boat were possible. To cause an explosion with petrol, first a leakage was necessary, and, secondly, a spark to ignite the mixture. A leakage could invariably be detected by smell, should it occur; but, in a properly designed system leaks should be practically non-existent. Even with vapour in the boat no direct danger existed, provided the boat was properly ventilated, and no switch was moved, or anything done to cause a spark. As a matter of fact, in practice the smell of petrol inside a boat was almost unknown. In the accident to A 5, where a petrol explosion occurred, the cause of the leakage was a badly packed gland of the petrol pump, the gland being screwed down metal to metal.

DANGER FROM EXPLOSIVES.

The English boats had covered over 30,000 miles under their engines and, with the exception of one small flash, in an early boat, no explosion except that in A 5 had occurred. The second possible cause of an explosion was due to hydrogen given off by the batteries in charging; but as this operation was only carried out when the boat was opened up for ventilation, no danger existed. The explosion which occurred in A 8, two hours after sinking, was probably due to the formation of this gas. The third cause—namely, the failure of the air reservoirs—was merely mentioned as a possibility; no greater danger from this cause existed on board a boat than on board an ordinary ship, where such accidents were unknown. It might, therefore, he thought, be assumed that danger to the boats from explosions was really small.

SALVAGE PROBLEMS.

The problems connected with the salvage of these boats differed from those usually met with, chiefly because the question of rapidity was, or might be, of vital importance as regards the possibility of saving life. The A class of boats had passed out of the experimental stage, and their manœuvre grounds were chiefly in the deeper waters; it was, therefore, evident that consideration of rapid salvage were totally ou of the question should foundering occur in the majority of the waters in which they worked.

Whatever appliances were available, wind, sea, and tide would always be the determining factors as regards rapidity of work. It had been suggested that the Admiralty should keep their own salvage plant for the general use of the Navy. This, Captain Bacon said, was a question for the Admiralty only, but he would most strongly advise their doing nothing of the sort. Any one who had been practically associated with salvage work knew that success depended largely on practical experience and constant practice. The mere plant was quite a secondary consideration, and easily obtained. Moreover, in all large salvage operations special gear had to be designed and built, and such appliances could not be kept stored. He hoped he had been able to set forth impartially the relative safety of submarine vessels compared to surface craft,

INSTITUTION OF NAVAL ARCHITECTS.

(Continued from page 197.)

Lieut.-Colonel G. Rota read a paper on experiments with models which is reprinted in full.

In the very important paper read last year by Mr. R. E. Froude at the Institution of Naval Architects there are some interesting results of model experiments of six different forms of hull, all derived from one, which is taken as a type, its form being afterwards altered by snubbing the fore and after end, and by changing the length scale. In the said paper notice is also taken of what the effect would be upon the resistance of the derived forms of changing the ratio of beam to draught the area of cross-section being unchanged, and the vertical and horizontal cross-sections being modified accordingly.

In Mr. Froude's experiments two cases of this variation of ratio are, in fact, taken into consideration, and he is led to believe that in the range of variation between the two ratios which he has considered, the resistance constant C, for a given speed constant K, increases in ratio of beam to draught—that is to say, arithmetically.

In order to study within what limits this proportion actually exists, taking a given form of hull, and in order to ascertain what would be the character of the variation of the resistance constant C for a given speed constant K, by altering the ratio of beam to draught (the area of the cross-section, as above stated, remaining unaltered), some model experiments were made at the experimental tank of the Royal Dockyard at Spezia, in which experiments within wide limits of the ratio of beam to draught have been considered, while the length and the area of cross-sections have been left unchanged for the five models considered.

The said experiments were made with five models all derived from the same form of hull taken as a type, which was designed for this purpose alone, and was also considered as the intermediate of the series.

Two models of the same cross-sections as the one taken as a type had ratios of beam to draught of 2·615 and 1·677 respectively. Two others had ratios of 5·130 and 6·704. The range of variation of ratio of beam to draught was, therefore, from 1·677 to 6·704, and within these ratios the difference of breadth of the successive models were alike. In this research experiment has, perhaps, gone beyond the field of the dimensions generally used in naval construction, but it has been done chiefly for a speculative purpose, as it seemed advisable to extend it between wide limits, in order better to estimate the character of the resistance by varying the ratio of beam to draught. On page 200 the lines of the experimental forms are shown.

THE METHOD EMPLOYED.

In the Appendix is given a table of the principal dimensions of the five forms experimented upon, Mr. Froude's classical method constants having been used to collect them. The results of the experiments are also given by the same method, which is a most useful one for experimental tank work, not only because of the facility for drawing practical deductions and for establishing comparisons by it, but also because of the advantages it offers for making the use of the functions (K and C), whatever may be the system of measurement employed in any particular calculation.

By adopting such a method, the function "speed constant" K, which is proportional to the ratio

$$\frac{\text{Speed}}{(\text{Displacement})^{\frac{1}{6}}},$$

has been considered instead of the speed, and the function "resistance constant" C, proportional to the ratio

$$\frac{\text{Resistance}}{(\text{Displacement})^{\frac{2}{3}} \times (\text{speed})},$$

and also to the ratio

$$\frac{\text{E.H.P.}}{(\text{Displacement})^{\frac{2}{3}} \times (\text{speed})^{3}}$$

has been considered instead of the resistance.

The curves of dimension constants* for the different models, by the adoption of the typical forms considered, fulfil the condition of having the length and the area of cross-sections constant. It is interesting to point out that the curves of skin resistance constant present, at a particular ratio of beam to draught a minimum value—that it is so may seem at first sight rather strange; but, considering that the wetted surface tends to become infinite when either draught or beam respectively reach such a value, it must be inferred that by varying the vertical and horizontal cross-section scales, the area of cross-section being unchanged, there is always a particular value of the ratio of beam to draught which has the advantage to offering a minimum wetted surface for every form of hull in all its varied transformations. This geometrical property is, in fact, common to all forms of hull.

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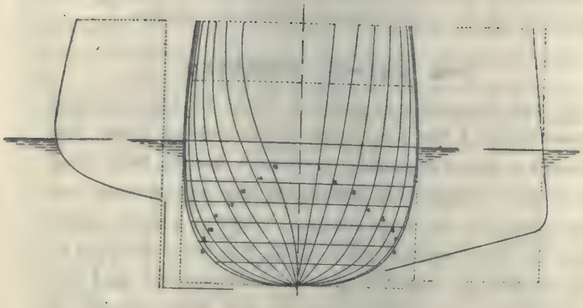
* Dimensions constant expresses the dimensions relatively to (displacement)$^{\frac{1}{3}}$, or (displacement)$^{\frac{2}{3}}$ if referring to square dimensions.

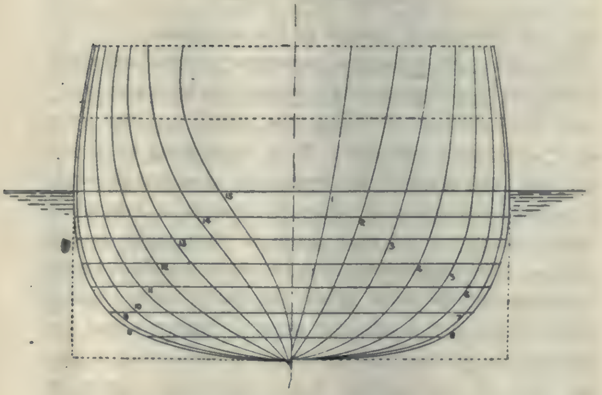
FIG. 1.



DIMENSIONS OF THE MODEL.

Length on the water line	Millimetres	3764
Length between the perpendiculars	,,	3600
Breadth	,,	360
Draught	,,	214·8
Trim	,,	20
Wetted surface	Square centimetres	19570
Area of max. cross section	,,	675
Displacement	Kilogrammes	137
Distance between the sections of the body plan	Millimetres	225

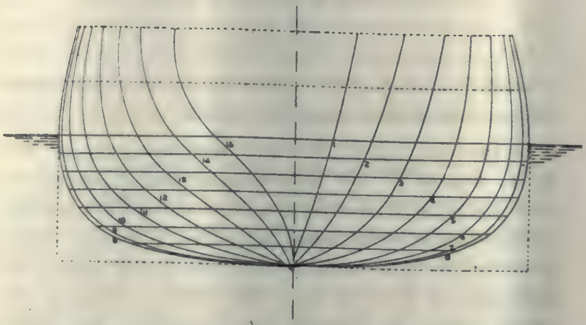
FIG. 2.



DIMENSIONS OF THE MODEL.

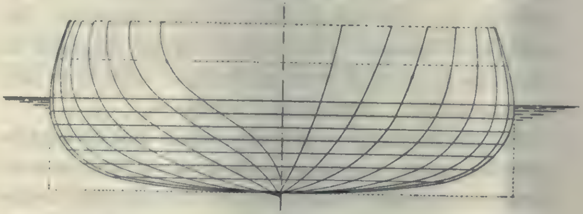
Length on the water line	Millimetres	3764
Length between the perpendiculars	,,	3600
Breadth	,,	450
Draught	,,	172
Trim	,,	16
Wetted surface	Square centimetres	18360
Area of max. cross section	,,	675
Displacement	Kilogrammes	137
Distance between the section of the body plan	Millimetres	225

FIG. 3.



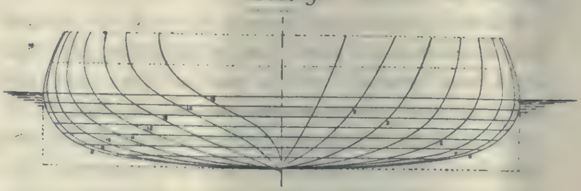
Length on the water line	Millimetres	3764
Length between the perpendiculars	,,	3600
Breadth	,,	540
Draught	,,	143·2
Trim	,,	13·3
Wetted surface	Square centimetres	18540
Area of max. cross section	,,	675
Displacement	Kilogrammes	137
Distance between the sections of the body plan	Millimetres	225

FIG. 4.



Length on the water line	Millimetres	3764
Length between the perpendiculars	,,	3600
Breadth	,,	630
Draught	,,	122·8
Trim	,,	11·4
Wetted surface	Square centimetres	19402
Area of max. cross section	,,	675
Displacement	Kilogrammes	137
Distance between the sections of the body plan	Millimetres	225

FIG. 5.



Length on the water line	Millimetres	3764
Length between the perpendiculars	,,	3600
Breadth	,,	720
Draught	,,	107·4
Trim	,,	10
Wetted surface	Square centimetres	20570
Area of max. cross section	,,	675
Displacement	Kilogrammes	137
Distance between the sections of the body plan	Millimetres	225

The author gives curves of wave resistance C values corresponding to K abscissa value, for the five models—that is to say, for the considered atio of beam to draught.

By varying the ratio of beam to draught for different K values, it has been possible to find how the total resistance, corresponding to the sum of the values C and F, varies for the various types of ships of the forms considered, but of 50, 100, and 150 metres in length.

DEDUCTIONS TO BE MADE FOR EXPERIMENTS.

On summarily examining this function, it appears that by changing the vertical and horizontal cross-sections scale in the way above indicated, for practically any size of the typical ships considered, there is, for a given speed constant K, a range of the value of the ratio of beam to draught, within the limits of which the total resistance remains practically unchanged. It seems, also that by increasing the value of the said ratio the corresponding increase of the value of the total resistance is gradual, and practically linear. There is a great affinity between the range of ratio to which the least resistance corresponds, as has just been said, and that to which the minimum wetted surface corresponds and, in fact, if we consider those speeds at which the resistance is on the whole mainly due to frictional resistance, it is plain that the curve expressing the function of the resistance to the base of the ratio of beam to draught has to have a character in harmony with that representing the wetted surface to the same

TABLE OF DIMENSION CONSTANTS.

Dimensions.		Type.				
		1	2	3	4	5
Length on the water-line ...	M_w	7·301	7·301	7·301	7·301	7·301
Length between perpendiculars	M	6·983	6·983	6·983	6·983	6·983
Breadth	B	·698	·873	1·047	1·222	1·396
Draught	D	·416	·334	·277	·238	·208
Trim	T	·038	·031	·025	·022	·019
Skin area	S	7·364	6·908	6·976	7·300	7·740
Max. cross-section area... ...	A	·254	·254	·254	·254	·254
Ratio, $\frac{\text{beam}}{\text{draught}}$	$\frac{B}{D}$	1·677	2·615	3·771	5·130	6·704

FORMULÆ FOR CONSTANTS.

Constant for any linear dimensions (M_w, M, B, D. T . . .) $= \frac{\text{Dimensions}}{\Delta^{\frac{1}{3}}} \times \cdot 3057.$

Constant for any square dimensions (S, A. . . .) ... ... $= \frac{\text{Square Dimensions}}{\Delta^{\frac{2}{3}}} \times \cdot 09346$

Speed constant ... ... $\kappa = \frac{V}{\Delta^{\frac{1}{6}}} \times \cdot 5834.$

Resistance constant
- C for wave resistance ... ... $= \frac{R}{\Delta^{\frac{2}{3}} V^2} 2938.$
- F for skin resistance... ... ... $= O\,S\,M^{\cdot 0875}\ \kappa^{-\cdot 175}$

$$E\,H\,P = \frac{(C + F)\,\Delta^{\frac{2}{3}}\,V^3}{427 \cdot 1}$$

Δ = displacement in tons in salt water, V = speed in knots, O = constant corresponding to any given length. (See Mr. R. E. Froude's Paper. Trans. I.N.A. 1888.)

base, so as to present a point of minimum value at the abscissa corresponding to the minimum wetted surface.

It may be practically concluded that in the unlimited series of forms which may derive from a given form of hull by changing the vertical and horizontal cross-sections scale, provided that the area of cross sections remains constant, there is a certain range of ratio of beam to draught, very close to that corresponding to the least wetted surface, within the limits of which there is not any sensible variation in the value of the resistance constant that is, the corresponding e.h.p. Owing to this peculiarity it is possible to bring eventual changing to the value of the said ratio, when required for constructive purposes, without causing any practical variation in the e.h.p. value.

From the short study here set forth, it is not, of course, intended to draw any general deduction of the subject, the question having been examined for a given model only, but it may nevertheless be taken as a contribution towards the great mass of experimental facts which might be continually increased by the help of those who, having at their disposal the proper means should always publish the results of their experiments.

And in this respect much is owing to Mr. R. E. Froude, who, being universally recognised as one of the highest authorities in naval architecture, has brought to light a great mass of results obtained by his classical experiments, which are of the greatest possible value to anybody interested in this branch of naval science.

NEWS ITEMS.

Effect of Temperature on Insulating Materials.

The Engineering Standards Committee have just issued its report on this subject. The experiments have been carried out by Mr. E. H. Rayner at the National Physical Laboratory, and in a paper read before the Institution of Electrical Engineers, and reported in PAGE'S WEEKLY the main results of the investigation have already been dealt with. The work was a very necessary one, and the sub-committee on generators, motors, and transformers, of which Col. Crompton is the chairman, felt that no decision on the question could be arrived at until reliable experimental data had been obtained. In order to ensure accuracy in the results some of the leading firms co-operated with the committee, and carried out a series of experiments at their own works. One of the aims of the investigation was to obtain standard conditions.

Taking the matter quite generally, it would appear that the properties of the materials tested were somewhat improved by heating up to 75 deg. C., although perhaps the resistance to punching and brittleness was not always improved up to that temperature. Even up to a temperature of 100 deg. C the dielectric strength of the materials improved, and the mechanical properties were not seriously affected, but at the higher temperature of 125 deg. and 130 deg. C. weakness began to manifest itself. One very interesting fact brought out by one of Mr Rayner's experiments was the way in which the temperature of cotton and all other nsulating materials changed as the moisture was dried out.

New Train-Stopping Device.

On the Brooklyn elevated cars provision has been made for the immediate stopping of a train in case of danger, in the following way:—

Two conductor's valves are inserted in the train line of the air-brake system, one at each end of the car, and cords of a bright blue colour extend from each valve along the opposite sides of the car beneath the ventilator, windows, and out under the hood.

By the pulling of one of these cords, the brakes will bring the train to a stop within two train lengths, this action being facilitated by the arrangement of the multiple-unit control system, which automatically shuts off current to the motors when the brakes are applied. The system of safety-brake cords permits a passenger to stop the train in case of impending danger without waiting to communicate with the guard or motorman, and it says much for the intelligence of the American public that the Traction Company have gone to the trouble to install this system. It is easy to see that a mischievous person could cause a great deal of trouble.

The annual statement of the navigation and shipping of the United Kingdom shows that the total volume of our foreign trade—entrances and clearances—during 1904 amounted to 108,390,150 tons, as compared with 105,619,344 tons in 1903 and 99,872,719 tons in 1902.

A MACHINE FOR DRAWING COKE FROM BEE-HIVE OVENS.

SEVERAL years ago, Mr. Robert A. Cook described and illustrated in the Transactions of the American Institute of Mining Engineers a mechanical coke-drawer, patented in 1891 by Mr. Thomas Smith of the Thorncliff Iron Works, Sheffield, England, and first introduced in the United States in 1896, at the coking plant of the Latrobe Coal Company, Latrobe, Pa. A paper recently contributed to the Institute by Mr. George T. Wickes describes a new machine, which, it is claimed, contains few wearing parts capable of withstanding continued rough usage.

Anything (says Mr. Wickes) which tends to prolong the general use of bee-hive ovens will be welcome to those who are interested in cheapening the cost of producing coke in such ovens, especially if it provides satisfactory mechanical means, replacing the hard labour involved in drawing coke by hand with the old-fashioned "duck bill." The difficulty of finding efficient coke-drawers, especially during the summer season, and in the south, is notorious. Yet, notwithstanding the great improvements that have been made in retort coke ovens, new bee-hive ovens are continually constructed; and a machine which will successfully compete with hand drawing, and, at the same time, add to the efficiency of the bee-hive oven, seems to deserve notice.

The machine here described was put in operation at the Frick Coal and Coke Company's plant, known as Continental No. 1, at Uniontown, Pa., in October, 1904, and is reported to have met successfully all the tests to which it has been subjected. This trial has demonstrated that one of these machines, equipped with an electric motor, and operated by one man with an assistant, besides two men to "water down" the ovens in advance of the machine, and one man to clean out what little coke may remain in the oven after the machine has finished its work, will, with the aid of the accompanying conveyor, draw more than thirty ovens per day of ten hours and load the coke on cars for shipment.

Possibly not everyone will agree with the advocacy of deep charges as against shallow ones, but to those who believe that the loss in fixed carbon is smaller in the deep charge, the advantage of the machine over hand drawing must be apparent, since no charge is too deep to prevent the machine from drawing it with ease. Therefore, the economical charge for a given oven may be fixed and determined by the operator without regard to time required or the fatigue experienced by a man drawing coke by hand.

Inasmuch as an oven can be drawn in not more than 20 min. (a record of 10 min. has been attained), provided the ovens are immediately re-charged, there is a substantial saving in heat conserved in the oven and in the time employed in burning off the charge of coke, in addition to the saving of approximately one-half the cost of hand work in drawing and loading. In other words, the efficiency of each oven is sensibly increased, while the cost of the operation is diminished.

Figs. 1 and 2 show the coke-drawing machine in position in front of a row of ovens and ready for operation. The machine operates smoothly, performing its work easily without jar, can be driven by steam or electricity, is capable of withstanding hard usage, and is compact and simple. The well-braced frame of iron, cast in one piece, is supported on a truck having four wheels. Within the frame are the necessary heavy cut-steel gearings which operate a steel ram equipped at its extremity with a chilled cast-iron shovel, thin at the front and 6 in. thick at the back, which serves as a wedge. The length of the ram and the power employed are sufficient to force the ram in under the coke to the back of the oven. By reversing the motion of the gearing the shovel is withdrawn from the oven with its load of coke. In other words, the ram acts like a wedge, raising and parting the coke so as to cause it to fall in the manner stated. The motor, of the street-railway type, is simple and easily operated. The machine can be moved forward or backward on its track and the carriage sustaining the ram can be revolved on a central axis, which allows the ram to be introduced into the oven at any angle, and thus to reach any part of it. In operation the central portion of the coke is drawn first, and then the ram carriage is swung on its axis so as to draw the coke on either side of the central line. While it is possible to reach any part of the oven by the arrangement above described, there will always remain in the oven a small quantity of coke, which it is expedient to remove by hand. This is readily accomplished by one man following the machine, who cleans out this remnant and also puts the oven in shape to receive a new charge.

By means of a worm gear inside of the frame the machine can be moved back and forth on a standard-gauge track to any desired position in front of the ovens. The coke, when drawn, falls on the conveyor, which is carried on a separate truck, and with a separate motor, and is so equipped as to screen the coke properly from ash, during travel, and deliver it into a railway car for shipment.

One question will naturally suggest itself to anyone interested in coke-making, namely: Does the machine deliver the coke on the cars in as good condition as coke which has been drawn and loaded by hand? Experienced men who have watched the machine under trial at Continental No. 1 freely admit the quality of the coke to be as good and as free from breakage as that which had been drawn and loaded by hand.

There are in addition the following advantages:—

The ovens are watered in advance of the machine by men who do nothing else, and who therefore can be trained to use only sufficient water to accomplish the desired result. They do not have to consider the heat which the hand drawer must needs face, and the foreman can accurately gauge and determine the amount of spraying which they shall do in order to insure only the minimum amount of water required to deaden the coke. Excessive watering occasions a loss of heat and produces black ends, and the use of the machine ought, in this respect, to produce much better results than can be obtained by hand drawing, in which many men are employed to water the coke.

After the machine has extracted the coke from an oven or ovens, provided the ovens are immediately put into shape for re-charging, the promptness with which ignition takes place is apparent to even the most casual observer, and is in strong contrast to the action of ovens which have been drawn by hand and exposed for two or three hours, or more, to the cooling action of the air.

An inspection of the working of the machine showed that one hour was ample in which to remove the coke from three ovens and put them in shape for the next charge.

A summary of the advantages of the mechanical coke drawer shows:—

There will be fewer black ends, owing to better control in watering down the coke. The quality of the coke will be in no way inferior to that drawn by hand. There will be a substantial economy of labour in drawing and loading coke. There will be considerable conservation of heat and better efficiency in operating the ovens. There will be a saving in time, or a corresponding increase in output. There is no field in which the substitution of a machine for hand labour will be more welcomed, since, in season and out of season, no manual labour is subjected to greater hardship (except, perhaps, in puddling) than in drawing coke from a bee-hive oven. Any intelligent man can easily and quickly be taught to operate the machine.

A test, recently made on four ovens drawn consecutively, gave the following data for the consumption of power:—

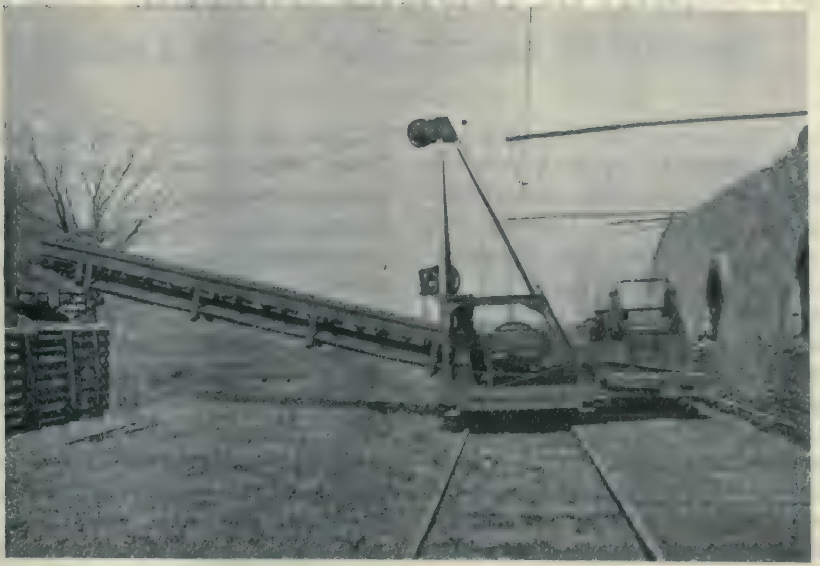
Average time of drawing = 16 min.
Average k.w. = hr.-consumption, total 2·2 min.
Average ampere-consumption on extractor = 30 amperes.
Average extractor-voltage = 170 volts.
Average ampere-consumption of conveyor = 16 amperes.
Average voltage of conveyor = volts.

SMOKE AND FOG PREVENTION.

The subject of smoke and fogs has been occupying the attention of the Engineering Section of the Institute of Public Health, Mr. Rollo Russell having read a paper on "The Prevention of Smoky Fogs," while Prof. Henry Adams contributed a paper on "Smoke Abatement." The point on which Mr. Russell wished to lay stress was that the character and persistence of London fogs was not due to an excess of particles, but to an excess of particles of a certain kind. The radiative and tarry particles from bituminous coal were by far the most effective, and ordinary dust was ineffective in ordinary weather. New York, prohibiting the burning of bituminous coal, had a clear air, and no persistent or yellow fogs. In all cases, towns burning wood had no extra fog; those burning common coal had dark days or yellow fog. The evidence that bituminous coal was the cause of persistent fogs when the surrounding country was bright might be further extended, and the smoke of this coal was also the cause of the almost continual thick haze in the London air—the foulness which obscured and spoilt the whole City.

Mr. Russell has not the least doubt that if London burnt wood, or anthracite, or gas, we should obtain an air as transparent in clear weather as that of Paris or of Rome. The excess of London fogs over the fogs of places thirty miles out would no more exist; there might even be a deficiency, owing to the large volume of warm air now rising over more than 100 square miles of ground artificially dried and warmed. Dark fogs, artificially prolonged, were due to the uneconomic burning of bituminous coal. Moreover, there was ample proof that not factories, but kitchen and ordinary fires, were the main cause of London fogs.

Prof. Henry Adams, dealing with smoke abatement, says that the head and front of the offence proceeds from factories and central stations.



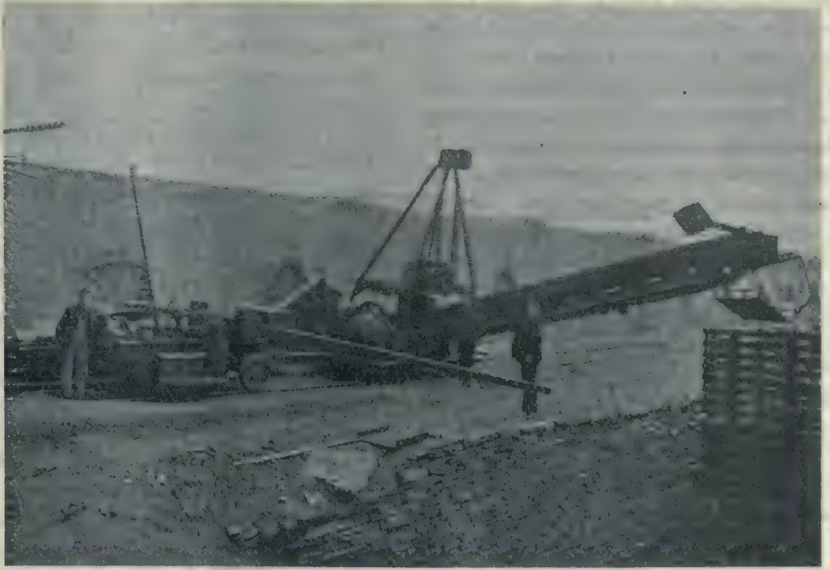


FIG. I. SIDE VIEW OF COKE-DRAWING MACHINE, SHOWING CONVEYOR TO CARS.
FIG. 2. SIDE VIEW, SHOWING RAM AND CONVEYOR.

SHIPBUILDING NOTES.

Messrs. Irvine's Shipbuilding and Dry Dock Company, Ltd., West Hartlepool, have launched from their shipyard a finely-modelled steel screw steamer, built to the order of Mr. Kenneth McD. Cameron, West Hartlepool. She is of the following dimensions: 336 ft. by 47 ft. by 24 ft. 10 in. The vessel is built to Lloyd's highest class under special survey, and is of the single-deck type, having poop, bridge and top-gallant forecastle. Engines of the triple-expansion type being supplied and fitted by Messrs. Richardsons, Westgarth and Co., Ltd., Hartlepool, having cylinders 24 in., 38 in., and 64 in. by 42 in., two large single-ended boilers. The vessel has been supervised during construction on behalf of the owners by Mr. R. Adams. The christening ceremony was performed by Mrs. Kenneth McD. Cameron, who named the vessel *Cameron* as she left the ways.

There was launched from the shipyard of Messrs. Cochrane and Sons, shipbuilders, Selby, on the 19th inst., a handsomely modelled steel screw trawler, the principal dimensions being 123 ft. 6 in. by 22 ft. by 11 ft. 6 in. depth of hold. The vessel has been built to the order of the Grimsby Victor Steam Fishing Company, Ltd., of Grimsby, and will be fitted with powerful triple-expansion engines by Messrs. C. D. Holmes and Co., of Hull. She is replete with all the latest improvements for fishing purposes. As the vessel left the ways she was christened the *St. George* by Miss Alice A. Allen, of Grimsby.

The official trial trip of the steamship *Sandown* took place on Thursday, July 20th, in Hartlepool Bay, the vessel attaining a speed of twelve and three-quarter knots over a series of runs. She has been built to the order of the British Maritime Trust Ltd., London, by Messrs. Furness, Withy and Co., Ltd., Hartlepool. The vessel is over 350 feet in length, has a large measurement capacity and takes Lloyd's highest class. Triple-expansion engines have been supplied by Messrs. Richardsons, Westgarth and Co. Ltd., Hartlepool, with cylinders 24, 39, 66 by 45 in. stroke, and two single-ended boilers, 16 ft. by 10 ft. 6 in. long at 180 lb. steam pressure. The machinery ran exceedingly well throughout the trial. The owners were represented by Mr. Vickers, the shipbuilders by Mr. Parker, and the engineers by Mr. Urquhart.

There was launched from the Southwick yard of Messrs. Robert Thompson and Sons last week the steel spar-decked steamer *Drumcliffe*, built to the order of Messrs. Joseph Chadwick and Son, of Liverpool. The principal dimensions are length over all 386 ft., breadth 49 ft. 9 in., depth moulded 27 ft. 8 in. The vessel is designed to carry a large cargo on a light draft of water, and is constructed with extra-strengthening to obtain Lloyd's minimum freeboard for three-decked vessels. She is being fitted out with all the most modern improvements for a first-class cargo and cattle steamer. The engines are being supplied by the North Eastern Marine Engineering Company, Ltd., Sunderland, having cylinders 25 in., 41 in., and 7 in. by 48 in. stroke, with three extra large boilers of 180 lbs. pressure. During construction the vessel and machinery have been personally superintended by Captain Chubb and Messrs. H. H. West and Son, of Liverpool. The vessel was christened by Mrs. Arthur Chadwick, of Sedbergh.

Messrs. Furness, Withy and Co., Ltd., Hartlepool, have launched the large steamer *Harley*. The vessel exceeds 357 ft. in length, is built on the deep-frame principle, with two steel decks, poop, bridge, and forecastle, and takes Lloyd's highest class. Triple-expansion engines will be supplied and fitted by Messrs. Richardsons, Westgarth and Co., Ltd., Hartlepool, with cylinders 24 in., 39 in., 66 in., by 45 in. stroke. This is the fourth vessel built by Messrs. Furness, Withy and Co., Ltd., for Messrs. Harrison.

On Monday, the 17th inst., Messrs. Osbourne, Graham and Co. launched from their yard at Hylton, Sunderland, the steel screw steamer *Hertot*, which they have specially built to the order of Messrs. George Gibson and Co., of Leith. The vessel is of the raised quarter-deck type, with special arrangement of large hatchways for shipping large machinery, and carries a cargo of 1,800 tons on a moderate draft, her principal dimensions being 235 ft., 33 ft. 9 in., 17 ft. 3 in. moulded. The electric light installation is being carried out by the Sunderland Forge and Engineering Company, Ltd. Engines and boilers are being supplied by Messrs. Richardsons, Westgarth and Co., Ltd., Sunderland, the former being 18 in., 30 in., and 49 in., by 33 in. stroke, with one large boiler of 180 lb. pressure.

IRON ORE DEPOSITS ABROAD.

POSSIBLE FIELDS FOR FUTURE ENTERPRISE.

(*Continued from page* 79.)

GERMANY.

THE iron ore deposits were originally, like all other minerals, the property of the State, but concessions have been granted to private individuals and companies to exploit. For the greater part the iron mines that are and have been worked are the property of great iron and steel works in the Rhenish Westphalian district, such as Gebrüder Stumm, Rothe Erde at Aachen, Krupp, Phönix, Dortmund Union, Hoerde, Boahumer Gusstahl, Gutehoffnungshütte, etc.

There are smaller companies and individual owners, who are not, perhaps, all wealthy, who would probably be prepared to sell their concessions or mines. For many years the iron-stone mines and concessions in Germany were rather a drug in the market, not being prosperous, the larger works importing ores from Bilbao and Sweden; but as applied science has advanced in the manufacture of iron and steel, they have been able to make use of ores which formerly were not manufactured into iron on account of their insufficiently pure quality.

The iron ore production of the Siegerland in recent years has been as follows:—1890, 1,765,509 tons; 1897, 1,794,457 tons; 1898, 1,640,877 tons; 1899, 1,800,980 tons; 1900, 1,841,618 tons; 1901, 1,668,683 tons; 1902, 1,394,209 tons. The reduction of the output of late is due to the depression in the market, which caused some works to reduce the production voluntarily and under syndicate regulations and agreements by 25.50 per cent per annum.

The recent development of the iron ore fields of Luxemburg and Lothringen has been quite astonishing. Should the exploiting of these two districts increase in the same proportion for a few years, these provinces will head the list of iron ore producers in this part of the continent.

According to Kohlmann's estimate, the wealth of iron ore is of vast extent; the deposits are said to amount to 1,800,000,000 tons in Lothringen, and 300,000,000 tons in Luxemburg. These ores contain a large amount of phosphorus, but the Thomas-Gilchrist process has altogether removed that impediment. In 1901 the principality of Luxemburg and the province of Lothringen together produced 12,000,000 tons of iron ore and nearly 2,500,000 tons of pig.

GREECE.

Iron ore, along with manganese, is reported to exist in Cephalonia. It is impossible to state exactly what the transport of ore would cost to the ports per ton. The only means available for transport are mule carts, carrying from 600 lb. to 1,000 lb. weight, according to the distance. Roads, however, do not approach several of these deposits, some of which are difficult of access, and the transport, where this is possible, by mule loads would be very slow and expensive. The ore becomes the property of the person or persons who discovered it and have obtained permission from Government to work it, the owners of the soil, whether rich or poor, having no other claim beyond 5 per cent. on the net profits made from the sale of the ore.

The area covered by this ore is put down approximately at 25,000 acres, which are partly under cultivation; but it is impossible as yet to say anything regarding the quantity to be obtained, and whether the quality of this ore will turn out to be such as to be worth the working of it. Beyond the samples sent to Athens, not a pound of this ore has gone gone out of the island.

Deposits of manganese and hematite iron ore are known to exist in several places in the consular district of Piræus, which comprises the provinces of Attica and Boeotia, Laurium, Phiotis, and Phokis in Continental Greece, and the island of Euboea.

In nearly every case applications are made to the Greek Government for concessions with a view to their being subsequently sold or leased, but most of the valuable concessions have already been sold or leased, generally to companies. Probably their definition of the word "reasonable" would be somewhat liberal.

Some of the manganese and hematite iron ores from the Laurium district have for some years past found a ready market in the United Kingdom; they may be said to have an average yield of 50 per cent. of iron. In the case of the ores of Placa, Dascalio, Sunium, and Allegrana, their contents in silica, phosphorus, and arsenic make them less marketable in the United Kingdom, and they are mostly exported to Holland and Belgium. The ores of Grammatico have a steady sale in Glasgow.

There are two mines, close to one another, situated near the sea-shore on Syra Island. One proprietor, Mr. E. E. Kéhayà, who is a man of capital, but willing to rent or sell on reasonable terms.

The above mines have been exploited since 1901. Three cargoes have been shipped to Glasgow, aggregating 6,640 tons, and three more are ready for shipment. Another mine exists at the south-west end of the island, distant from the harbour ten miles by land and eleven nautical miles by sea. It has been worked at intervals only, the distance from the town augmenting the expenses of labour and transport compared with the two mines above-mentioned. The present proprietor is endeavouring to sell his rights.

There are many deposits in Zea and the adjoining island of Makronisi. It is said proprietors would only be too pleased to sell or lease their mines on reasonable terms. Nearly all the mines have been worked hitherto, and a total of 25,000 tons been exported, mostly to the United Kingdom, since 1898. Work on the Spathi, Oreos, and Petrussa mines has been at a standstill for some time past owing to lack of capital and scarcity of ore. At Schino the work is only in an experimental stage at present.

Three iron ore deposits exist in Thermia Island. The proprietors are of good standing, and willing to entertain offers on reasonable terms. All three mines are being worked. The total output since the first was started in 1896 until the end of 1902 amounts to 106,500 tons, and was shipped to Glasgow, St. Nazaire, Dunkirk, and Rotterdam. The output this year is expected to reach over 75,000 tons, as two of the mines are very busy; the third will commence to export next year.

ITALY.

The island of Elba contains important deposits of iron ore, known as the Elba Iron Ore Mines. The iron ore deposits extend from north to south almost parallel to the eastern coast of the island; they extend to the sea on the northern and southern coasts. The most important deposits are in close proximity to, or at the utmost not more than a mile distant from, the coast. The mines are entirely worked on the surface by digging and blasting. The refuse is thrown away into the sea or discharged near the mines at places where no minerals are supposed to exist. The extracted ore is sent down to the depôts near the sea by railway tracks, inclined planes, suspended wires, carts, etc. The loading is carried out in carts or on railway trucks.

The Elba mines belong to the Italian Government, which has granted them on lease for a term of twenty-five years from 1896 to the "Elba Società Anonima di Miniere ed Alti Forni." The central mines have been worked from the time of the Romans, and probably even before then.

For the last five years the following quantities of ore have been shipped from the Elba mines to—

—	1898.	1899.	1900.	1901.	1902.
England ...	110,960	102,711	89,210	66,802	189,946
Italy	16,785	24,280	40,225	15,700	80,107
United States of America ...	—	41,674	13,967	—	—
France	28,279	29,164	11,770	13,296	1,164
Germany (via Netherlands)..	72,225	53,266	45,810	41,816	19,557

The Elba Iron Mines are estimated still to contain, within a certain limited space, from 8,000,000 tons to 10,000,000 tons of iron ore.

The exploiting company (Elba Società Anonima di Miniere ed Alti Forni) has erected in Portoferraio two blast furnaces, which at present produce about 450 tons of pig iron per diem, and will shortly reach 700 tons.

Steel works will be shortly erected in Portoferraio, so it is now difficult to foresee whether the Elba mines will be sufficient to supply the ore to the furnaces for nineteen years, as the demands from the iron works of the continent of Italy are gradually and constantly increasing. For this reason shipments of iron ore to foreign countries are absolutely at a standstill, and the whole output of the Elba mines (about 300,000 tons per annum) is shipped to Portoferraio or to other Italian ports

Mr. Vice-Consul Tonietti adds: Some private iron ore mines outside the geological circumference of the Royal mines are just being opened up, and as they are my own property, it is probable that their output will be sold to foreign countries, I having already made a special agreement with the Italian Government.

No data can as yet be given as to their possibilities, but they appear to be of some importance, and the ore is proved by analyses to be of good quality.

Small mines in all the three groups belong to one or more well-known persons, and could, perhaps, be purchased. The proprietorship of others is not easily defined. The necessity of entering into negotiations with many individuals whose rights at times do not exceed 100 lire (£4) in value is an almost insurmountable obstacle to purchasers. Furthermore, some of the mines are in a very bad condition, and some of the beds, that are already worked, have pits on their slopes resulting from the primitive methods followed, and these are often flooded with water.

NAVAL NOTES.

WITH the visit to Portsmouth Dockyard on Friday last a notable meeting of the Institution of Naval Architects came to a close. Some of the papers read have attracted attention in circles where, as a rule, little interest is taken in the proceedings of the great engineering institutions. Captain Bacon's lecture on "The causes of accidents to submarines, and their salvage" was an authoritative pronouncement on a subject not merely of technical but of national interest, and his statements will have an assuring effect on the minds of those hysterical writers whose only comment on the recent accidents was to call for an international arrangement to erase the submarine from the lists of ships of war. The accidents by which brave men have lost their lives should teach other lessons than this. It is satisfactory to learn on the authority of Captain Bacon that there is no excessive liability to accident in the service of submarine boats, and that the accidents which have been recorded are of a nature which should not recur.

Critics of submarines are apt to overlook the fact that the existing submarine is a fighting ship, and many of the safety devices proposed are such as would destroy its value as a fighting unit, and, therefore, impracticable. Meanwhile the lessons of the past are not being forgotten; indeed experiments are even now being conducted with the view to acquiring more knowledge of the probable behaviour of the submarine boat under certain conditions. Salvage operations, it is clear, have little chance of saving life when an accident happens; the obvious moral is that everything possible must be done to avert them. To that object the best skill of those charged with the conduct of these affairs is being assiduously devoted,

The discussion which followed Captain Bacon's lecture found an expert like Sir William White in practical agreement with the conclusions arrived at, his differences with the lecturer being on mere points of detail. To the two main causes of accident which were referred to by Captain Bacon, he adds a third. He pointed out that the inquiry into the A 8 disaster showed that there was a possibility of rapid diving under certain conditions of draught and speed, and perhaps by certain accidental circumstances which could hardly be foreseen as the boat was passing from awash to diving conditions. The experiments now being conducted on the subject of "critical draught" are of the highest importance, and results should be published. He hoped to see also published Captain Bacon's evidence before the Devonport inquiry with regard to the longitudinal stability of the A 8 under various conditions of loading. He thought that on the question of reserve of buoyancy, Captain Bacon had hardly stated his case strongly enough. In the case of the A 8 the experts held that six tons of buoyancy with a surface speed of 10 knots would have given safety, which was less than half the full buoyancy. More knowledge of the whole of the problems surrounding submarines was required. At present we were in many respects facing the unknown. In particular Sir William White wants to see means taken to eliminate as far as may be the possibility of human error in regard to boats designed for under-water navigation. The accident to the *Farfadet* is admitted to be due to an error of judgment.

The first comparison of reciprocating engines and turbines under actual service conditions was the subject of a paper by Mr. W. Gray, read at the meeting of the Institution of Naval Architects. The facts there set forth naturally bring out the superiority of the turbine. Mr. James Denny who opened the discussion pointed out that although the *Londonderry*, one of the turbine-fitted steamers of the Midland Company, did not appear to have maintained its efficiency in actual service, the trial trips gave results considerably in favour of that steamer. Mr. Denny who, with Mr. Parsons, has been a pioneer in the matter of turbine steamers, pointed out that the English Channel service had demonstrated the superiority of the turbine in bad weather. Mr. Parsons quoted a few figures with regard to the *Londonderry* and the *Manxman*, the turbines in which have the same co-efficients as those in the third-class cruiser *Amethyst*. Five or six years ago it had been believed that the turbines were more efficient than the reciprocating engines to the extent of about 15 per cent., but the latest experience showed that at full speed the difference amounted to about 40 per cent. in favour of the turbine. With reference to the superior results obtained in the *Manxman* it had been found that the larger the vessel the slightly better the performance, and he believed that the explanation was that in the larger ship the frictional losses in the propeller were less.

Another paper read before the Institution of Naval Architects is reported in this issue. Reference is made to the paper of Mr. Milton as to the causes of fracture in steel boiler plates, and the discussion was in the capable hands of Mr. Spencer, Mr. Strohmeyer, and Mr. Scott Younger, all of whom expressed somewhat definite views on a problem where indefinite opinions have hitherto prevailed. And in an appendix to the paper, the expert opinions of Professor Arnold are set out at length. In the case of the American plates referred to, Professor Arnold is of opinion that overheating took place, and on the subject of crystallisation he refers to an entirely new phase of the question, which he thinks the investigation has opened up.

Mr. Spencer, as a steel maker, took a somewhat different view to the author of the paper, and he pointed out it was a question on which steel makers and engineers would not unnaturally take different sides. He was of opinion that the cause of failure in the particular plates referred to was unequal strain in these plates; the point in dispute was whether the strains were in the plate before they left the manufacturer, or whether they were set up by any action in preparing them for the boiler. In a carelessly conducted steel mill there were many opportunities in which these strains could be set up, and the speaker let it be known incidentally that during a recent visit to the United States he had noticed with some amazement that plates were straightened after rolling instead of being rolled straight.

Conflicting views were held as to overheating. Mr. Spencer was rather disposed to think apparently that the operations of cutting the manholes out and drilling the holes and then riveting, probably double riveting, might very easily increase the temperature to an extent as to cause some difference in that plate. If that were so then in these high carbon steels the slightest strain would start the cracks. Mr. Strohmeyer thought that certain qualities of steel had the property of being injured by such mechanical treatment as shearing, and certainly this was true of plates containing a large proportion of phosphorus. Mr. Scott Younger believed that something in the process of manufacture was competent to produce these internal stresses. The discussion was, however, cut short in order that the Institution might lunch with the P. and O. Company at Tilbury, and for the completion of an informative discussion and Mr. Milton's reply, with any comments by Professor Arnold, we must await the issue of the Transactions.

CONTRACTORS' NEWS.

We shall be pleased to insert under this column, free of charge, particulars of open contracts

CONTRACTS OPEN.

Last Day.

Ipswich.—Supply and erection of a Cornish type boiler, which is to have a heating surface of approximately 400 square feet, for the Guardians. Mr. Richard J. Kent, clerk, Guardians' Offices, 19, Tower Street, Ipswich ... ... Aug. 5

Widnes (Lancs.).—Tenders for the following plant: A bench of 12 retorts and regenerative furnaces; vertical condensers; combined engine and exhauster, 5,000 per hour; washer; tower scrubber; three luteless purifiers, 8 ft. square; single-lift gasholder and steel tank, 35,000 capacity. Mr. Isaac Carr, M.I.C.E., Farnworth, Widnes ... ... Aug. 7

Swansea.—Supply of new slightly defective or good second-hand steel rails and fishplates, as follows, for the Swansea, Harbour Trustees: 100 to 200 tons rails, Vignoles flat-bottomed section, about 75lb. per yard, with fishplates to match, delivered f.o.r. Prince of Wales's Dock. Mr. Talfourd Strick, clerk, Harbour Offices, Swansea ... ... Aug. 10

Fleetwood (Lancs).—The supply and erection of town's gas engines and vertical treble-ram pumps, in duplicate, capable of delivering 260 cubic feet of sewage per minute through a total lift of 27½ ft., including friction. Also for the supply and erection of town's gas engines and centrifugal pumps in duplicate, capable of delivering 620 cubic feet of sewage per minute, through a total lift of 21¼ ft., together with starting apparatus, water-tank, travelling crane, workshop fittings, and other appliances and connections. As alternative to the above-described machinery, tenders for supply and erection of producer-gas plant, producer-gas engines, vertical treble-ram pumps, and centrifugal pumps, all in duplicate, capable of performing the aforesaid duties. Mr. Geo. R Strachan, M.I.C.E., 9, Victoria Street, Westminster, London ... ... Aug 10

Maryport.—Tender for a new centre-ladder, barge-loading bucket dredger complete, delivered at Maryport, for the Maryport Harbour Commissioners, to Mr. F. Kelly, clerk of the Commissioners, Harbour Office, Maryport ... ... Aug. 18

Dundalk.—The Dundalk Harbour Commissioners are prepared to entertain applications for supplying a new or second-hand tug, not less than 90 feet long by 18 feet beam; paddle or twin screw; hull of mild steel; if a twin-screw, counters to be well down and broad; one funnel; boiler, mild steel, with pressure of 100 lb.; not less than 60 h.p.; speed not less than 10 knots. Mr. N. Callan, A.M.I.C.E., Harbour Office, Dundalk ... ... Aug 31

Last Day

Wolverhampton.—A vertical triple expansion pumping engine and other work connected therewith, for the Corporation of Wolverhampton. Mr. E. A. B. Woodward, waterworks engineer, Town Hall, Wolverhampton ... ... Sep. 1

Merthyr Tydfil.—Erection of refuse destructor plant capable of effectually burning 120 tons of refuse per day, together with all buildings and contingent works connected therewith, for the Merthyr Tydfil Urban District Council. Mr. T. Fletcher Harvey, engineer and surveyor to the Council, Town Hall, Merthyr Tydfil Sept. 1

Southampton.—Supplying and fixing at the Corporation Wharf, Chapel, three 18 in. high-pressure direct-acting centrifugal pumping engines, including all suction and delivery pipes, steam and other connections, for the Corporation. Mr. J. A. Crowther, A.M.I.C.E., borough engineer, Market-chambers, 123, High-street, Southampton ... ... Sept. 4

Bishop's Stortford.—The Urban District Council invite tenders for supplying and fixing gas pumping engine, suction gas plant, and sewage pumps at their sewage pumping station. Mr. Thos. Swatheridge, clerk, Council Offices, 7, North Street, Bishop's Stortford ... ... Sept. 12

Great Western Railway.—Construction of the Birmingham and North Warwickshire railway between the main line at Tyseley and the Stratford branch near Bearley, length of about 18¾ miles for the Great Western Railway Co. New Works Engineer, Paddington Station, London.

COMING CONTRACTS.

Birmingham.—The Electric Supply Committee have had under consideration the erection of sub-stations at a cost of £50,000.

Croydon.—The Corporation have decided to promote a Bill in Parliament for a big water scheme, which includes the development and equipment of the existing works, the construction of new walls and reservoirs, and filtration works. The cost will be £260,000.

Rochester.—The Corporation have decided to extend the tramway system to Borstal at a cost of £20,000.

Rugby.—An inquiry has been held into the application for powers to borrow £450 for street-lighting and £2,000 for electric lighting.

Llandilo.—The Light Railway Commissioners have decided to recommend an order for the construction of the Llandilo to Lampeter light railway (22¾ miles), estimated to cost £153,873.

Frome.—Acting on the advice of their consulting engineer, the Council have decided to apply for sanction to a further loan of £11,000 for electric lighting extensions.

Barking.—An inquiry was held last week into the Council's application for an order to make certain extensions of their light railways at an estimated cost of £12,200.

Bradford.—It was reported at the meeting of the West Riding Rivers Board, on Tuesday, that the Bradford Corporation had decided to construct half-a-dozen new settling tanks at the Frizinghall sewage works, at an estimated cost of £6,000.

Leeds.—A scheme for the purification of the sewage is being prepared for the approval of Parliament.

CONTRACTS CLOSED.

London.—The tender of Mountain and Gibson has been accepted by the London County Council for four electrically-driven water cars required for use on the electric tramways at £2,360. The London County Council and also accepted the offer of G. Skey and Co. to supply an additional 250,000 stoneware cable ducts for £3,193 15s., and of Stanley Bros. to supply an additional 500,000 ducts for £6,800, for the reconstruction of about 22½ miles of tramway on the north side of the Thames.

Brighton.—The Town Council accepted the tender of Babcock and Wilcox for coal-handling plant at Southwick electricity works at £1,966.

Birmingham.—The Tramways committee have accepted the tender of W. Hopkins for the erection of car sheds and a sub-station at £25,437. Thwaites Brothers, Ltd., have secured the contract for the supply of 17 steam hammers for use at the works of the Metropolitan Amalgamated Railway Carriage and Wagon Co., Ltd., Birmingham. Important orders for the Imperial Japanese Government are at present in hand at the company's works.

Kilpatrick.—Messrs. Goldie and Company have secured the contract for constructing the new shipyard at Old Kilpatrick for Messrs. Napier and Miller, of Yoker.

Japan.—The Japanese Government have placed an order with Messrs. Brown, Marshall and Company for 550 provision wagons for the Manchurian Railway, to be delivered at the rate of 40 per month. They are practically covered goods trucks, similar in pattern to the English type, but built to the Japanese standard gauge, which is narrower than the Russian gauge. Further orders for rolling stock are expected, as it is the intention of the Japanese authorities to convert the stretch of line from Mukden to Harbin to their own gauge.

Italy.—A contract has been placed by the Italian State Railway administration for three rail motor saloons with Messrs. Kerr, Stuart and Co., of Stoke-on-Trent. The vehicles, which are to be erected according to Messrs. Kerr, Stuart and Co.'s own special design, and equipped with locomotive boilers, will be shipped within six weeks. Messrs. Kerr, Stuart and Co. secured this contract in competition with the principal rolling stock makers on the Continent.

Falkirk.—The British Electric Plant Company, Ltd., of Alloa, N.B., have contracted to supply the corporation of Falkirk with a complete installation of electric motors for the new municipal gasworks. These gasworks will be the first in Great Britain to be exclusively driven throughout by electric motors.

APPOINTMENTS VACANT.

Cawnpore, India.—Assistant Municipal Engineer under the Municipality. Salary Rs. 375 a month and an agreement for five years. Mr. Frank E. Priest, 13, Harrington Street, Liverpool. ... ... July 31

Newcastle. — City engineer and town surveyor under Corporation. The gentleman appointed will be required to devote the whole of his time to the duties of his office, and not to undertake, or engage in, any other employment. Salary, £800 per annum, rising £100 per annum to £1,000 per annum. Mr. Hill Motum, Town Clerk, Newcastle ... ... August 5

Burma Railway.—Three appointments as temporary assistant engineers in the Way and Works Department in Burma. Salary Rs. 410 per month. Mr. A. G. Begbie, managing director, Gresham House, Old Broad Street, E.C. ... ... August 10

Leeds.—City Engineer under Corporation. Salary £000 per annum. Mr. Robt. E. Fox, Town Clerk, Leeds ... ... —

APPOINTMENTS FILLED.

Canada.—Mr. Collingwood Screiber, deputy-minister and chief engineer in the Department of Railways and Canals, Ottawa, has been appointed consulting engineer for the Government aided Transcontinental Railway.

Ashton-under-Lyne.—The Tramway Committee appointed Mr. Joseph Dugdale as tramway manager. Mr. Dugdale has for the past year been manager and engineer of the Oxford tramways, and previously was traffic superintendent at Sheffield.

Liverpool.—Mr. W. H. Watkinson, of the Glasgow and West of Scotland Technical College, has been appointed to the Harrison Chair of Engineering at Liverpool University, vacant by the resignation of Prof. Hele-Shaw. Prof. Watkinson served his apprenticeship at Keighley, and after holding an appointment in engineering works at Bradford, went through a complete course of engineering at the University of Glasgow.

Leyton.—Mr. F. Schofield, traffic superintendent of the Bradford city tramways, has been appointed general manager of the Leyton tramways at a salary of £300 a year.

Poplar.—The Poplar Borough Council have appointed Mr. W. Innes, St. Andrew's Cross Electricity Works, Glasgow, assistant electrical engineer, at a salary of £200 per annum, rising by annual increments of £10 to a maximum of £300 a year.

Brighton.—The Brighton Corporation Tramways Committee recommend that Mr. William Marsh be appointed tramways engineer and manager at a salary of £300 per annum, increasing by annual increments of £50 to a maximum of £400.

Leeds.—Mr. J. B. Hamilton, general manager of the Leeds tramways, has been elected president of the Municipal Tramways Association.

Share List of Engineering, Electrical, Iron and Steel, and other Companies.

The following is a comprehensive list of Companies in the industries covered by "Page's Weekly," in which shares business is being currently transacted. Additions will be made from time to time as occasion requires. We desire it to be understood that whileour Share List will generally be found correct, we do not hold ourselves responsible for any loss or inconvenience that may arise from possible inaccuracies.

Stock Exchange Settling Days.—**Settling days on the Stock Exchange are as follows:—**

Consols: Aug. 3rd, Sept. 1st. General Settlements: July 28th, August 16th, 31st. Bank Rate, March 9th, 1905, 2½ per cent.

I.—ENGINEERING, IRON, AND STEEL COMPANIES.

Present Amount Subscribed.	Shares.	Last Dividend.	Name.	Paid up.	Closing Prices.
11,370	5	5%	Alldays & Onions Pneumatic Engineering, Ltd.	3	1¾—2¼
10,000	5	3/-	Do. Cum. Pref. 6 per cent. ..	5	4½—4¾
3,210,000	1	1/-	Armstrong (Sir W. G.), Whitworth and Co., Ltd.	1	3 3/16—3 5/16
76,970	5	2/-	Do. 4% Cum. Pref.. ..	5	5⅜—5⅝
1,500,000	100	4%	Do. 4% 1st Mort. Dbs. Rd.	100	102—104
£100,000	100	4½%	Aveling and Porter, Ltd., 4½% Reg Mt. Debs. Red.	100	96—99
530,000	1	2/4⅘	Babcock and Wilcox, Ltd., Ord. ..	1	8⅜—8⅝*
100,000	1	7⅕d.	Do. „ 6% Cum. Pref.	1	1½—1⅝
20,000	5	3/-	Baker (Joseph) and Sons, Ltd., 6% Cum. Pref.	5	4¾—5¼
250,000	1	6⅗d.	Baldwins, Ltd., 5½% Cum. Pref. ..	1	1—1⅛
£250,000	Stk	4½%	Do. 1st Mt. 4½% Deb. Stk. Red.	100	102—104
150,000	4½	2/8⅖	Barrow Hæmatite Steel Co., Ld., O	4½	1 3/16—1 5/16
50,000	4½	3/-	Do. do. Cum 2nd. Pref.	4½	4⅛—4⅜
33,334	5	2/6	Bayliss, Jones and Bayliss, Ltd., 5% Cum. Pref. Shares ..	5	4¾—5¼
£500,000	100	4½%	Beardmore (Wm.) & Co., Ltd., 4½% 1st Mt. Debs., Red., Scrip 50% pd	—	103—105
50,000	10	6/-	Bell Brothers, Ltd., 6% Cum. Pref.	10	12—12½
£366,600	Stk	4%	Do 4% Deb. Stock, Red.	100	98—100
200,000	1	1/-	Beyer, Peacock and Co., Ltd., Ord.	1	¼—⅜
300,000	1	6⅗d.	Do. 5½% Cum Pref.	1	9/16—11/16
£300,000	Stk	4½%	Do. 4½% Red. Deb. Stock	100	94—97
1,629,760	1	6d.	Bolckow, Vaughan and Co., Ltd., O. Nos. 1-1,629,760	1	15/16—1
1,860,900	1	3⅗d.	Do. Nos. 1,639,101-3,500,000	12/-	½—9/16
1,160,000	1	10½d.	Brown (John) and Co., Lim., Ord., Nos. 1-1,160,000	15/-	1 3/16—1 5/16*
590,000	1	1/2	Do. Ord., Nos. 1,160,001-1,750,000	1	1 11/16—1 13/16*
74,000	10	5/-	Do. 5 % Cum. Pref.	10	11⅛—11⅜*
154,500	5	5/-	Cammell, Laird & Co., Ltd., Ord. ..	5	8⅝—8⅞
232,500	5	2/6	Do. 5% Cum. Pref. ..	5	5⅜—5⅝
450,000	1	1/2⅖	Clayton & Shuttleworth, Ltd., Ord.	1	29/32—31/32
70,000	5	2/6	Do. 5% Cum. Pref.	5	5¼—5½
£250,000	Stk	4%	Do 4% 1st Mort. Db. Stk. Red	100	100—102
100,000	10	7/6	Consett Iron Co., Ltd., Ord.. ..	7½	31½—32½
57 031	10	10/-	Crossley, Bros., Ld, Ord. 40340/97370	10	15⅞—16
40,339	10	5%	Do. 5% Cum. Pref. ..	10	11¾—11⅞
75,000	1	2/6	Delta Metal, Ltd. Shares	1	2⅛—2⅜
1,259,594	1	3⅗d.	Dorman, Long & Co., Ltd. ..	1	15/32—17/32
£400,000	Stk	4%	Do. 4% 1st Mort. Perp. Deb. Stk.	100	87—91
200,000	5	3/-	Dunderland Iron Ore Co., Ltd., 6% Cum. Pref. and Participating..	5	2¾—3¼
250,000	1	9⅗d.	Dunlop (James) & Co., Ltd., Ord...	1	9/16—11/16
300,000	1	7⅕d-	Do. 6% Cum. Pref. ..	1	⅞-1
4,721	13	13/-	Ebbw Vale Steel, Iron & Coal Co., Ltd.	13	8½—9½
69,754	13	10/-	Do. do. do.	10	6½—7
20,250	10	8/-	Elliott's Metal, Ltd.	3	4¾—5¼
5,000	10	5%	Do. Cum. Pref. 5%	10	8¾—9¼
186,748	Stk	4%	Do. Deb. 4%	100	90—94
25,000	10	6/-	Fairfield Shipbuilding & Engng.Co., Ltd., 6% Cum. Pref. ..	10	10¾—11¼*
£250,000	Stk	4½%	Do. 4½% Mort. Deb. Stk .Red.	100	100—103
9,000	10	10%	Fleming & Ferguson, Ltd. Ord. Nos. 1/9000..	10	12¼—12½
6,000	10	5%	Do. 5% Cum. Pref. Nos. 9001/15000	10	9½—10
126,000	3	3/-	Fraser & Chalmers, Ltd., Ord. ..	3	3¾—4¼
21,000	3	1/6	Do. 7½% Cum. Pref.	3	5½—6*
10,000	10	5%	Galloways, Ltd., 5% Cum. Pref. 18001/28000	10	6—7
£150,000	Stk	4%	Do. 4% 1st Mort. Deb Red..	100	88½—89½
16,800	10	10/-	Greenwood & Batley, Ltd., Ord. ..	10	6¼—6¾*
9,600	10	7%	Do. 7% Cum. Pref.	10	10—10½
965,000	1	1/-	Guest, Keen & Nettlefolds, Ltd. Ord.	1	2 5/16—2 7/16
341,000	5	2/6	Do. 5% Cum. Pref.	5	6½—6¾
£1,850,500	Stk	4%	Do. 4% Irred. Mort. Deb.Stk	100	104—106
18,000	5	2/6	Gwynnes, Ltd., 5% Cum. Pref. ..	5	2—3
250,000	1	3/6	Hadfield's Steel F'dry Co., Ld., Ord.	1	3 7/16—3 9/16
20,000	10	4/6	Do. 4½% Cum. Pref.	10	10½—11
30,000	5	3/-	Hall (J. & E.), Ltd. 6% Cum. Pref...	5	5—5½
408,505	1	1/6	Harvey United Steel Co., Ltd. ..	1	1¼—1⅜
47,500	10	7½%	Hawthorn, Leslie & Co., Ltd. Ord.	10	97—99
28,001	5	7/-	Head, Wrightson & Co., Ltd. ..	5	4¾—5¼
85,000	1	7⅕d.	Hill (Richard) & Co. (1899) Ld., Ord.	1	11/16—13/16
18,000	5	3/-	Do. 6% Cum. Pref.	5	4¾—5
£10 ,000	Stk	6%	Hornsby (Richard) & Sons, Ld., Ord. 6% Cum. Pref.	100	98—100

ENGINEERING, IRON, AND STEEL COMPANIES.—*Contd.*

Present Amount Subscribed.	Shares.	Last Dividend.	Name.	Paid up.	Closing Prices
750,000	1	7½%	Howard & Bullough, Ltd., Ord. ..	1	1⅝—1¾*
25,000	10	6/-	Do. 6% Pref. (Non-Cum.) ..	10	12¾—13¼*
£250,000	Stk	4%	Do. 4% Deb. Stk., Red. after 1905	100	95—98
37,500	10	20	Kynoch, Ltd.	10	17—17½*
49,537	10	5%	Do. Cum. Pref. 5% ..	10	10⅜—10⅝*
300,000	1	4⅗d.	Lambert Bros., Ltd., Ord.	1	⅝—⅞
50,000	5	2/9	Do. 5½% Cum. Pref.	5	4—4½
40,000	8	2/1⅕	Leeds Forge Co, 7% Cum. Pref. ..	8	3¾—4
200,000	1	7⅕d	Lysaght (John), Ltd., 6% Cum. Pf.	1	1 5/16—1 7/16
£300,000	Stk	4½%	Do 4½% 1st Mt. Deb. Stk., Red.	100	107—109
40,000	10	5/-	Mather & Platt, Ld., 5% Cum. Pref	10	11¾—12
210,000	1	8⅖d.	Measures Bros., Ltd., Ord.	1	½—¾
75,000	1	6⅗d.	Do. 5½% Cum. Pref.	1	13/16—15/16
£75,000	Stk	4½%	Do. 4½% 1st Mrt. Db. Stk., Red.	100	92—95
21 943	5	2/6	Muntz Metal, Ltd.	5	4⅞—5⅛
14,248	5	5%	Do. Pref. 5%	5	4⅞—5⅛
5,000	62½	47/6	Nantyglo and Blaina Iron Works, Ltd., 8% Cum. Pref.	62½	79—81
73,000	10	5/-	N. Brit. Loco. Co., Ltd., 5% Cm. Pf.	10	12⅛—12⅜
80,000	5	—	North-Eastern Steel Co., Ltd.,		
£250,000	Stk	4½%	4½% 1st Mrt. Db. Stk., Red.	100	88—91
122,000	5	1/6	Pearson & Knowles Coal and Iron Co., Ltd., Ord., "B"	5	3⅝—3⅞
50,000	5	3/-	Do. 6% Cum. Pref. "A" ..	5	6½—6¾
70,000	10	6/-	Pease & Partners, Ltd., Ord. ..	10	9¼—9¾
£400,000	Stk	4%	Do. 4% Perp. Deb. Stock	100	98—101
20,000	5	3/-	Peebles(Bruce) & Co., Ld., 6% Cm.P.	5	5—5¼
65,000	1	—	Pooley (Henry) & Son., Ltd., Ord ..	1	6/-—6/6
13,000	5	—	Do. 5½% Cum. Pref.	5	4—4¼
230,000	1	—	Projectile Co. (1902), Ltd., Ord. ..	1	⅜—½
126,938	5	2/-	Rhymney Iron Co., Ltd.	5	1⅝—1⅞
73,062	5	2/-	Do. New	5	1½—1¾
£330,000	—	5%	Do. 5% Mort. Deb., Red. ..	100	99—101
350,000	1	7½d.	Richardsons, Westgarth & Co., Ltd., Ord. 350,001—700,000 ..	1	25/32—27/32
£350,000	1	7⅕	Do. 6% Cum. Pref.	1	⅞—1
£350,000	Stk	4½%	Do. 4½% Perp. Deb. Stock ..	100	93—95
35,000	10	12/-	Ruston, Proctor & Co., Ltd... ..	10	10—10½
275,000	1	6d.	Scott (Walter) Ltd., Ord.	1	⅝—¾
300,000	1	7⅕d.	Do. 6% Cum. Pref. ..	1	13/16—15/16
£300,000	Stk	4%	Do. 4% Perp. Deb. Stk.	100	92—94
£115,300	100	5%	Shelton Iron, Steel and Coal Co., Ld. 1st Charge 5% Debs.. Red ..	100	90—93
£97,900	100	6%	Do. 6% 2nd Mort. Debs., Red.	100	91—95
250,000	1	1/-	South Durham Steel & Iron, Ltd.Or.	1	11/16—13/16
300,000	1	1/2⅖	Do. 6%Cum. Pref...	1	¾—⅞
£300,000	Stk	4½%	Do. 4½% Per. Deb. Stock	100	90—93
49,560	10	2½%	Steel Co. of Scotland Ord. 1/49560..	9	5½—5¾
£125,240	Stk	5%	Do. 5% Trust Mort. Deb. ..	100	105—106
25,000	10	—	Stephenson (Robert) & Co., Ltd., Or.	10	2¼—2½
25,000	10	5/6	Do. 5½% Cum. Pref. ..	10	4—4¼
£250,000	Stk	4%	Do. 4% Perp. Deb. Stock	100	76—79
85,000	10	9/-	Stewarts & Lloyds, Ltd., Ord. ..	10	17¾—18¼
55,000	10	6/-	Do. 6% Cum. Pref.	10	14½—14¾
684,732	1	6d.	Swan, Hunter & Wigham-Richardson, Lim. Ord.	1	13/16—15/16
538,845	1	6d.	Do. 5% Cum. Pref.	1	⅞—1
£240,000	Stk	4½%	Do. 4½% 1st Mort.Deb Stk.Red	100	96—99
300,000	1	6d.	Thames Iron Works, Shipbuilding & Engineering Co., Ltd., 5% Cum.Pf.	1	½—⅝
£200,000	100	4%	Do. 4% Irredeem. 1st Mort. Deb.	100	76—80
£148,500	1	7⅕d.	Thornycroft (John I.) & Co., Ltd.Or.	1	⅝—⅞
£160,000	1	7⅕d.	Do. do. 6% Cum. Pref.	1	15/16—1 1/16
10,000	10	5/-	Tylor (J.) & Sons, Ltd. 5% Cum.Pf.	10	9¼—9¾*
$508495200	$100	$½	United States Steel Corp. Com.Stk.	$100	34⅞—35
$360314100	$100	$1¾	Do. 7% Cum. Pref. Stock	$100	104½—105
$162268000	$1000	5%	Do. 10-60yr. 5% Skg.Fd.G.Bds.	$1000	97—99
3,350,000	1	1/6	Vickers, Sons & Maxim, Ltd. Ord..	1	2 7/16—2 9/16
750,000	1	6d.	Do. 5% Non-Cum. Pref. ..	1	1 3/16—1 5/16
£750,000	Stk	5%	Do. 5% Non-Cum. Pref. Stock.	100	119—122
£1,250,000	Stk	4%	Do. 4% 1st.Mort.Deb.Stk.Red.	100	104—106
£1,000,000	100	4½%	Do. 4½% 2nd Mort. Debs.,Red.	100	105—107
225,000	1	1/2⅖	Weardale Steel, Coal & Coke, Ltd., Def. Ord.	1	13/16—15/16
500,000	1	7⅕d.	Do. 6% Cum. Pref. Ord. ..	1	15/16—1 1/16
£300,000	Stk	4%	Do. 4% Perpetual Deb.Stock	100	84—87
7,637	5	2/9	Weldless Steel Tube, Ltd., Cum. Pref. 5½	5	4½—4¾
300	Stk	4½%	Do. Mort. Deb. 4½%	100	92—98
66,666	5	3/.	Willans & Robinson, Ord.	5	1—2
66,666	5	3/-	Do. 6% Cum. Pref.	5	2½—3½
£246,641	Stk	4%	Do. 4% 1st Mort.Deb.Stk.Red	100	73—78
£150,000	Stk	4½%	Yorkshire Iron & Coal Co., Ltd., 4½% 1st Mort. Deb. Stk. Red.	100	74—76

Stocks and Shares marked * are quoted ex-dividend.

II.—ELECTRICAL MANUFACTURING COMPANIES.

Present Amount Subscribed.	Shares.	Last Dividend.	Name	Paid up.	Closing Prices.
70,000	1	6d.	Alliance Elec. Co., Ltd. 5% Cum. Pf.	1	⅝—⅞
125,000	1	7½d.	Aron Elec. Meter Ltd., 6% Cum. Pf.	1	7/16—9/16
120,000	1	1/2⅜	Bell's Asbestos Co., Ltd.	1	⅞—1
100,000	5	4/-	British Insulated & Helsby Cables Ltd., Ord. ..	5	5½—6
100,000	5	3/-	Do. 6% Cum. Pref.	5	5½—6
£500,000	Stk	4½%	Do. 4½% 1st Mort. Deb. Stk. Rd.	100	101—104
£200,000	Stk	4½%	British Thomson-Houston Co., Ltd., 4½% 1st Mort. Deb. Stk. Red. ..	100	100—102
400,000	5	8/-	British Westinghouse Electric and Manufac. Co., Ltd., 8% Pref. ..	5	2⅜—2⅝
£616,358	Stk	4%	Do. 4% Mort. Deb. Stk. Red...	100	86—88
105,731	2	2/-	Brush Elec. Enging. Co., Ltd., Ord..	2	½—¾
150,000	2	2/4⅘	Do. 6% Pref.	2	1—1½
£125,000	Stk	4½%	Do. 4½% Perp. 1st Deb. Stk...	100	92—95
£125,000	Stk	4½%	Do. 4½% Perp. 2nd Deb. Stk.	100	77—80
35,000	5	7/6	Callender's Cable & Constn. Ltd. Ord.	5	10—11
40,000	5	2/6	Do. 5% Cum. Pref.	5	5½—5¾
£200,000	Stk	4½%	Do. 4½% 1st Mort. Deb. Stk. Red.	100	106—108
85,000	3	1/6	Crompton & Co., Ltd...	3	1¾—2
£100,000	—	5%	Do. 5% 1st Mort. Reg. Debs.	100	94—99%
52,000	5	10/-	Dick, Kerr & Co., Ltd., Ord. ..	5	7¾—8¼
61,000	5	3/-	Do. 6% Cum. Pref.	5	5¾—6
£300,000	Stk	4½%	Do. 4½% Deb. Stock, Red. ..	100	104—106
233,334	1	6d.	Doulton & Co., Ltd., 5% Cum. Pref.	1	1⅛—1⅜
£233,334	Stk	4%	Do. 1st Mort. 4% free. Deb. Stk.	100	106—109
99,261	5	1/6	Edison and Swan United Electric Light, Ltd., "A" Shares Nos. 1-99,261	3	1⅛—1⅜
17,139	5	2/6	Do. "A" Shares Nos. 01-017,139	5	2—2½
£344,023	Stk	4%	Do. 4% Deb. Stock Red. ..	100	83—88
£100,000	Stk	5%	Do. 5% Second Deb. Stk. Red.	100	89—94
112,100	2	1/7½	Electric Construction Co., Ltd. ..	2	⅜—⅝
31,390	2	2/9⅗	Do. 7% Cumulative Pref. ..	2	1¾—2¼
£200,000	Stk	4%	Do. 4% Perp. 1st Mt. Deb. Stk.	100	93—96*
10,248	10	7/6	Evered and Co., Ltd.	10	11—13
£100,000	Stk	5%	Ferranti, Ltd., 5% 1st Mort. Deb. Stock, Red...	100	90—95
25,000	10	5/-	Gen. Elect. Co. (1900), Ltd., 5% Cum. Pref.	10	9½—10
£200,000	Stk	4%	Do. 4% 1st. Mt. Deb. Stk., Red.	100	97—101
35,000	5	10/-	Henley's (W. T.) Telegraph Works Co., Ltd., Ord.	5	11½—12½
35,000	5	2/3	Do. 4½% Cum. Pref.	5	5⅜—5⅝
£50,000	Stk	4½%	Do. 4½% Mt. Deb. Stk. Red.	100	109—111
50,000	10	5/-	India Rubber, Gutta Percha & Telegraph Works Co., Ltd.,	10	15½—16½
£300,000	100	4%	Do. 1st Mort. Deb. Red. ..	100	100—103
7,500	10	—	Parker, Thos., Ltd.	10	6½—7
100,000	1	3%	Scott (Ernest) & Mountain, Ld., Ord.	1	16/3—16/9
37,350	12	12/-	Telegraph Construction and Maintenance Co., Ltd.	12	31—33
£150,000	100	4%	Do. 4% Deb. Bonds	100	101—103

III.—ELECTRIC TRACTION.

Present Amount Subscribed	Shares.	Last Dividend.	Name.	Paid up.	Closing Prices.
120,000	5	5/-	Anglo-Argentine Trams Co., Ld., Or.	5	8⅜—8⅝
260,007	5	2/6	Do. 5% Cum Pf.	5	5⅞—6⅛
£230,000	Stk	6%	Do. Permanent 6% Debenture Stock, 1888 ..	100	141—144
20,000	10	12/-	Barcelona Trams Co., Ltd., Ord. ..	10	13¾—14¼
10,000	10	5/-	Do. 5% Cum Pf. Shares	10	9½—10
£46,300	100	5%	Do. 5% Debs., Red. ..	100	99—102
£191,326	Stk	4½%	Do. 4½% Red. Deb. Stk.	100	98—103
75,606	1	—	Bath Elec. Trams. Ld., Pf. Or. ..	1	13/16—15/16
59,394	1	11·1d	Do. 5% Cum. Pf. ..	1	15/16—1 1/16
75,000	5	—	Brisbane Electric Tram Investment Co., Ltd., Ord.	5	1—1½
75,000	5	2/6	Do. 5% Cum. Pf. ..	5	3¾—4¼
£425,000	Stk	4½%	Do. 4½% 1st Deb. Stk., Red.	100	92—95
£200,000	Stk	6%	Brit. Columbia Elec. Rly. Co., Ltd., Def. Ord. Stock	100	105—108
		5%	Pref. Ord. Stock	100	98—101
133,301	10	6/-	Brit. Electric Traction, Ltd., Ord.	10	8¾—9¼
156,487	10	6/-	Do. 6% Cum. Pref.	10	11—11½
£1,000,000	Stk	5%	Do. 5% Perp. Deb. Stk. ..	100	122—124
£250,000	Stk	4½%	Do. 4% 2nd Deb. Stk. Red..	100	97—99
100,000	5	2/6	Buenos Ayres & Belgrano Electric Trams, Ltd., Ord.	5	3—3¼
40,500	5	3/-	Do. "A" 6% Cum Pref. ..	5	5 7/16—5 11/16
27,000	5	3/-	Do. "B" do.	5	5—5½

ELECTRIC TRACTION.—*Contd.*

Present Amount Subscribed.	Shares.	Last Dividend.	Name.	Paid up.	Closing Prices.
£200,000	Stk	5%	Buenos Ayres Elec. Trams Co. (1901) Ltd., 5% Db. Stk., Red.	100	96—98
£220,000	100	6%	Buenos Ayres Gd. Nat., Ltd., 6% 1st Deb. Bds.	100	100—103
102,268	5	5/-	Calcutta Tramways Co., Ltd. ..	5	9⅛—9⅜
£350,000	Stk	4½%	Do. 4½% 1st Deb. Stk., Red.	100	106—108
480,000	1	6d.	Cape Electric Tramways, Ltd.	1	1⅛—1⅜*
40,000	5	2/6	City of Birmingham Trams Co., Ltd. 5% Cum. Pref.	5	4⅞—5⅛
£300,000	100	4%	Do. 4% 1st Mort. Debs. ..	100	99—102
£120,000	Stk	5%	Colombo Elec. Tram. & Light. Co., Ltd., 5% 1st Mort. Deb. Stk. Red.	100	102—104
60,000	10	6/-	Dublin United Trams. Co. (1896), Ltd., Ord. ..	10	13½—14½
59,987	10	6/-	Do. 6% Pref...	10	15—16
30,000	5	2/6	Isle of Thanet Elec. Trams. and Light. Co., Ltd., 5% Cum. Pref.	5	2¾—3¼
£150,000	Stk	4%	Do. 4% Deb. Stock.. ..	100	83—88
125,000	10	5/-	London United Trams. (1901), Ltd., 5% Cum. Pref.	10	9½—10
£1,031,000	Stk	4%	Do. 4% 1st Mort. Deb. Stk. Red.	100	98—101
£50,000	Stk	5%	Madras Electric Trams (1904), Ltd., 5% Deb. Stock, Red.	100	102—104
314,016	1	—	Metropolitan Elec. Trams, Ltd., Def.	1	9/32—11/32
500,000	1	6d.	Do. 5% Cum. Pref... ..	1	1—1 1/16
£350,000	Stk	4½%	Do. 4½% Deb. Stock, Red.	100	104—106
50,000	5	6/-	New General Traction Co., Ltd., 6% Cum. Pref.	5	½—1½
110,923	8	3/2⅔	North Metropolitan Tramways Co..	8	4½—5
£150,000	100	3½%	Do. 3½% Mort. Debs.	100	90—95
£196,200	Stk	5%	Perth Electric Trams, Ltd. (W.A.) 5% 1st Mort. Deb. Stock, Red..	100	103—106
24,500	10	10/-	Potteries Elec. Traction Co., Ld., Or.	10	8¾—9¼
24,500	10	5/-	Do. 5% Cum. Pref. ..	10	9¼—9¾
£220,000	Stk	4½%	Do. 4½% Deb. Stk., Red.	100	101—104

IV.—ELECTRIC LIGHTING AND POWER.

Present Amount Subscribed.	Shares.	Last Dividend.	Name.	Paid up.	Closing Prices.
7,500	10	14/-	Bournemouth & Poole Elec. Sup. Co., Ltd., Ord. ..	10	11¾—12¼
7,500	10	4/6	Do. 4½% Cum. Pref. ..	10	10—10½
7,500	10	6/-	Do. 6% Cum. Second Pf. ..	10	11¼—12¼
£70,000	Stk	4½%	Do. 4½% Deb. Stock Red ..	100	106—108
14,000	5	3/6	Bromley (Kent) Elec. Lt. & Pr. Co. Ld	5	5¼—5¾
£50,000	Stk	4½%	Do. do. 4½% 1st Deb. Stk. Red.	100	103—106
27,507	5	5/6	Brompton & Kensington Elec. Supply Co., Ltd. Ord. ..	5	9¼—10¼
12,493	5	3/6	Do. 7% Cum. Pref. Shares..	5	9—10
60,000	5	5/-	Calcutta Elec. Sup. Cor. Ltd., Ord..	5	9—9½
£288,782	Stk	4%	Central Elec. Sup. Co., Ltd., 4% Gua. Deb. Stk. ..	100	103—106
70,000	5	4/-	Charing Cross & Strand Elec. Sup. Corp., Ltd., Ord... ..	5	6¾—7¼
80,000	5	2/3	Do. do. 4½% Cum. Pref...	5	5¼—5¾
£350,000	Stk	4%	Do. do. 4% Deb. Stk. Red.	100	104—106
41,436	5	3/9	Chelsea Elec. Sply. Co., Ltd., Ord.	5	6—6½
£150,000	Stk	4½%	Do. do. 4½% Deb. Stk., Red	100	108—110
70,595	10	7/-	City of London El. Lghtg. Co., Ld., O.	10	10¼—11¼
40,000	10	6/-	Do. 6% Cum. Pref.	10	13—14
£400,000	Stk	5%	Do. 5% Deb. Stk., Red ..	100	122—126
£300,000	Stk	4½%	Do. 4½% 2nd Deb. Stk., Red	100	103—105
40,000	10	5/-	County of London Elec. Supply Co., Ltd., Ord.	10	7½—8½
30,000	10	6/-	Do. 6% Cum. Pref.	10	11½—12½
£400,000	Stk	4½%	Do. 4½% Deb. Stk., Red. ..	100	111—114
70,000	5	2/6	Edmundson's Elec. Cor. Ltd., Ord.	5	5¾—6¼
70,000	5	3/-	Do. 6% Cum. Pref.	5	6—6¼
£300,000	Stk	4½%	Do. 4½% 1st Mort. Db. Stk. Reg	100	105½-107½*
£80,000	Stk	5%	Electric Lighting & Traction Co. of Australia, Ltd. 5% Deb. Stk. Red.	100	85—90
10,000	5	/6	Folkestone Elec. Supply Co., Ld., O.	5	5½—5¾
£50,000	Stk.	4½%	Do. 4½% 1st Deb. Stk., Red.	100	101—104
15,000	10	—	Havana Electricity Co., Ltd... ..	10	9½—10½
13,000	5	5/-	Hove Elec. Lighting Co., Ltd., Ord.	5	7¾—8¼
£50,000	Stk	4½%	Isle of Wight Electric Light & Power Co., Ltd. 4½% Deb. Stock, Red.	100	100—103
150,000	1	—	Kalgoorlie Electric Power & Lighting Corp, Ltd., 6% Cum. Pref.	1	¾—⅞
21,000	5	7/-	Kensington and Knightsbridge Electric Lighting Co., Ltd., Ord. ..	5	11¼—12¼

Stocks and Shares marked * are quoted ex-dividend.

ELECTRIC LIGHTING AND POWER.—*Contd.*

Present Amount bscribed.	Shares.	Last Dividend.	Name.	Paid up.	Closing Prices.
£135,000	Stk	4%	Kensington and Knightsbridge Electric Lighting Co., Ltd., and the Notting Hill Electric Lighting Co., Ltd., 4% Deb. Stock, Red.	100	102 —104
111,000	3	1/9⅗	London Elec. Supply Corp., Ld., Ord.	3	2 — 2½
60,000	5	3/-	Do. 6% Pref.	5	4½— 5½
£371,895	Stk	4%	Do. 4% 1st Mort.Db.Stk., Red.	100	99 -101
100,000	10	11/-	Metropolitan Elec. Sup. Co., Ld., Or.	10	9½— 10
76,121	5	2/3	Do. 4½% Cum. Pref.	5	5¼ — 5⅝
220,000	Stk	4½%	Do. 4½% 1st Mort.Db.Sk., Red.	100	109 —113
250,000	Stk	3½%	Do. 3½% Mort. Deb. Stk., Red.	100	98 —100
£250,000	—	4½%	Midland Elec. Corp. for Power Distribution, Ld., 4½% 1st Mort. Deb.	100	99—101%
10,852	10	8/-	Notting Hill Elec. Ltg. Co. Ltd. Ord.	10	14 — 15
£59,000	100	4%	Do. 4% 1st Mort. Debs. ..	100	100 —102
16,500	5	4/6	Oxford Electric Co. Ltd., Ord. ..	5	6½— 7
£50,000	Stk	4%	Do. 4% Debenture Stk. Red.	100	98 —100*
£84,700	100	4½%	Royal Elec. Co. (of Montreal) 4½% 20-yr. 1st Mort. Deb	100	101 —104
40,000	5	9/6	St. James' & Pall Mall Elec. Light Co., Ltd. Ord.	5	13¾— 14¼
20,000	5	3/6	Do. 7% Pref...	5	8½— 9
£150,000	Stk	3½%	Do. 3½% Deben. Stock, Red	100	97 —99
12,000	5	4/-	Smithfield Markets Elec. Supply Co., Ltd. Ord.	5	2½— 3
£50,000	Stk	4%	Do. 4% Debenture Stk. Red.	100	78 — 82
65,000	5	4/-	South London Elec. Sup. Co., Ltd. O.	5	3½ — 4
100,000	1	—	South Metropolitan Elec Light & Power Co., Ltd. Ord.	1	¾ — ⅞
50,000	1	8⅔d.	Do. 7% Cum. Pref.	1	1¼ — 1⅜
£100,000	Stk	4½%	Do. 4½% 1st Deb. Stock Red.	100	106 —109
50,000	5	2/6	Urban Electric Supply Co., Ltd., O.	5	4⅝— 4⅞
30,000	5	2/6	Do. 5% Cum Pref.	5*	5⅛— 5⅜
£200,000	Stk	4½%	Do. 4½% 1st Mort.Deb.Stk.Red	100	104—106
110,000	5	7/6	Westminster Elec. Supply Corp. Ltd., Ord.	5	11½—12½
28,151	5	2/6	Do. 5% Cum. Pref.	5	6⅛ —6⅝

V.—TELEGRAPH & TELEPHONE COMPANIES.

Present Amount Subscribed.	Shares.	Last Dividend.	Name.	Paid up.	Closing Prices.
£34,800	100	4%	African Direct Tel. Co., Ld., 4% Mt. Debs. (Series A), Red.	100	98 —101
25,000	10	—	Amazon Telegraph Co., Ld... ..	10	2¼ — 2¾
£763,580	Stk	15/-	Anglo-American Tel. Co., Ltd., Ord.	100	58 — 60
£3,118,210	Stk	30/-	Do. 6% Preferred Ordinary	100	105½—106½
£3,118,210	Stk	2/-	Do. Deferred Ordinary ..	100	12¾— 13
44,000	5	3/-	Chili Telephone Co., Ltd.	5	7⅛— 7⅜
$15,000,000	$100	$2	Commercial Cable Co., Capital Stk.	$100	———
£1,903,856	Stk	4%	Do. Sterl. 500-yr 4% Deb. Stk., Red.	100	96½—98½
16,000	10	5/-	Cuba Submarine Tel. Co., Ld., Ord.	10	8¼— 8¾
6,000	10	10/-	Do. 10% Preference	10	17 — 18
6,000	5	2/-	Direct Spanish Telegraph Co., Ord.	5	3⅜— 3⅝
		5/-	10% Cum. Preference	5	9 — 9½
£30,000	50	4½%	Do. 4½% Debs...	50	100-103%
60,710	20	3/-	Direct U.S. Cable Co., Ltd... ..	20	11⅛—11⅜
£85,800	100	4½%	Direct West India Cable Co., Ltd., 4½% Reg. Debs.	100	99—101
£300,000	100	4%	East. & S. African, Ld., 4% Mt. Dbs.	100	101—103
£200,000	25	4%	Do. 4% Rg. Mt. Dbs. (Mauritius Subsidy)..	25	100½102½%
300,000	10	2/6	Eastern Extension, Australasia and China, Ltd...	10	13¾—14¼*
£602,400	Stk	4%	Do. 4% Mort. Deb. Stk., Perp.	100	106 — 108
£4,000,000	Stk	25/-	Eastern Tele. Co., Ltd., Ord. ..	100	146 --149
£2,000,000	Stk	17/6	Do. 3 % Pref.	100	89— 91*
£1,836,814	Stk	4%	Do. 4% Mort. Deb.	100	107 —109
150,000	10	5/-	Great Northern Telegraph Co., Ltd., (of Copenhagen) ..	10	34½—35½
£58.700	100	4½%	Halifax and Bermudas Cable Co., Ltd., 4½% 1st. Mort. Debs. Red.	100	99—101
17,000	25	12/6	Indo-European Tele. Co., Ltd. ..	25	51 — 53
72.680	1	7½d.	Monte Video Telephone Co., Ltd., O.	1	¾— ⅞
£1,983,333	Stk	6%	National Telephone Co., Ltd., Pref.	100	111 —112
£1,966 667	Stk	5%	Do. Deferred	100	107 —109
250,000	5	2/6	Do. 5% Non-Cum. 3rd Pref.	5	5⅝ — 5⅞
£2,000,000	Stk	3½%	Do. 3½% Deb. Stk., Red. ..	100	99 —101
£689,[illegible]93	Stk	4%	Do. 4% do. do. ..	100	102½-104½
179,313	1	8⅔d.	Oriental Telephone & Elec. Co., Ltd.	1	1 3/16— 1 5/16
50,000	1	7⅕d.	Do. 6% Cum. Pref.	1	1 1/16—1 3/16
£100,000	100	4%	Pacific & European Tel. 4% Guar. Debs. Red...	100	97 —100
11,839	8	4/-	Reuter's Telegram Co., Ltd. ..	8	7½— 8
58,000	5	3/-	United River Plate Telep. Co., Ltd.	5	6¾— 7¼*
40,000	5	2/6	Do. 5% Cum. Pref.	5	5⅛— 5⅜
£179,947	Stk	5%	Do. 5% Deb. Stock, Red. ..	100	107—109
15,609	10	5/-	W. African Telegraph Co., Ltd. ..	10	8½ — 9
£30,008	2½	—	West Coast of America, Ltd. ..	2½	7/16 — 9/16
150,000	100	4%	Do. 4% Deb. Guar. by West. Tel.	100	99 —101

TELEGRAPHS AND TELEPHONES.—*Contd.*

Present Amount Subscribed.	Shares.	Last Dividend.	Name	Paid up.	Closing Prices.
88,321	10	6d.	W.India & Panama Teleg. Co., Ld., Or.	10	½ — ⅝
34,563	10	6/-	Do. 6% Cum. 1st. Pref. ..	10	8— 8½
4,669	10	6/-	Do. 6% Cum. 2nd Pref. ..	10	5¾— 6¼
£80,000	100	5%	Do. 5% Deb.	100	101 —104
207,930	10	3/-	Western Telegraph Co., Ltd. ..	10	13¾ —14¼
£75,000	100	5%	Do. 5% Debs., 2nd Series, 1906	100	100 —102
518,945	Stk	4%	Do. 4% Deb. Stock, Red. ..	100	101 —103

VI.—SHIPPING COMPANIES.

Present Amount Subscribed.	Shares.	Last Dividend.	Name.	Paid up.	Closing Prices
32,500	10	5/6	Anchor Line (Henderson Bros.), Ltd., 5½% Cum. Pref.	10	8¾— 9
£325,000	Stk	4½%	Do. 4½% Red. 1st Mort. Deb. Stk.	100	99—101
£672,900	Stk	4½%	British & African Stm. Nav. (1900) Ltd., 4½% 1st Mort. Deb. Stk., Red.	100	95 — 97
40,000	10	5/6	Bucknall Steamship Lines, Ltd., 5½% Cum. Pref.	10	5¾— 6¼
£600,000	Stk	4½%	Do. 4½% 1st Mort. Deb. Stk.	100	87 — 91
£750,000	Stk	4½%	Clan Line Steamers, Ltd., 4½% Deb. Stk. Red. ..	100	99 —101
60,000	20	16/-	Cunard Steam Ship Co., Ltd., Nos. 1-60,000..	20	11¾ — 12¼
40,000	20	8/-	Do. Nos. 60,001-100,000	10	4¾— 5¼
£464,430	Stk	4½%	Elder Dempster Shipping, Ltd., 4½% 1st Mort. Deb. Stk. ..	100	100—102
1,200,000	1	6d.	Furness, Withy & Co., Ltd., Ord...	1	1¼ — 1⅜
25,328	7½	4/7	Gen. Steam Navigation Co., Ld., Ord.	7½	5 — 5¼
36,758	8	4/9⅗	Do. Non-Cum. 6% Pref.	8	7¾— 8¼*
£150,000	Stk	4%	Do. 4% 1st Mort. Deb. Stk. Red.	100	98 —100*
55,000	5	1/3	Houlder Line, Ltd., Ord.	5	2¼— 2¾
40,000	5	2/9	Do. 5½% Cum. Pref.	5	2¾— 3¼
£200,000	Stk	4½%	Do. 4½% 1st Mt. Deb. Stk. Red.	100	86 — 88
141,500	10	5/-	Leyland (Fredk.), & Co., (1900), Ltd., 5% Cum. Pref. ..	10	4 — 4½
£1,160,000	Stk	5 %	Peninsular and Oriental Steam Nav. Co., 5% Cum. Pref. ..	100	128 —131
£1,160,000	Stk	19%	Do. do. Deferred ..	100	223 —226
15,000	100	30/-	Royal Mail Steam Packet Co. Ord..	60	34½— 35½
39,075	5	2/6	Shaw, Savill & Albion, Ltd., 5% Cum. "A" Pref..	5	4¾— 5¼
39,075	5	2/6	Do. "B" Ord...	5	4 — 4½
141,841	10	4/-	Union Castle Mail Steamship Co., Ltd., Ord..	10	8½— 8¾
24,000	10	4/6	Do. 4½% Cum. Pref... ..	10	10¼— 10¾
£1,008,894	Stk	4%	Do. 4% Debenture Stk., Red.	100	101 —103

VII.—MISCELLANEOUS COMPANIES.

Present Amount Subscribed.	Shares.	Last Dividend.	Name.	Paid up.	Closing Prices.
60 000	1	9⅗d.	Chadburn's (Ship) Tele. Ltd., Ord...	1	1⅛— 1¼
£750,000	Stk	9%	General Hydraulic Power Co., Ltd.	100	126 —131
12,500	10	10/-	Oakey (John) and Sons, Ltd., Ord..	10	24 — 26
10,000	10	6/-	Do. do. 6% Cum. Pf.	10	14 — 15
183,538	1	6·3d.	Power Gas Corp., Ltd., Ord., Nos. 66,463-250	15/-	¼ — ⅜
66,462	1	8·4d.	Do. do. Nos. 1 66,462	1	⅜ — ½
135,000	1	6d.	Waygood (R.) & Co., Ltd., Ord. ..	1	1 1/16 —1 3/16
135,000	1	7⅕d.	Do. 6% Cum. Pref. ...	1	1 1/16—1 3/16*

RAILWAY CARRIAGE & WAGON COMPANIES.

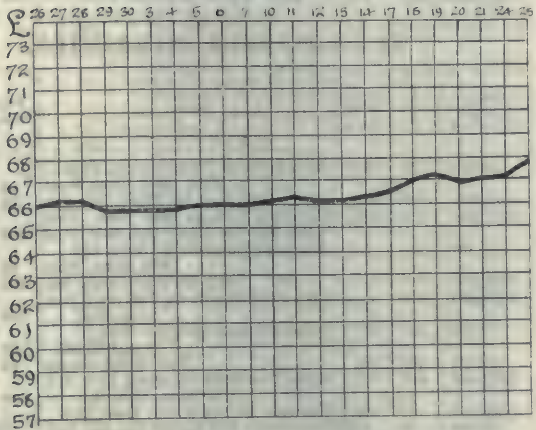
Present Amount Subscribed,	Shares.	Last Dividend.	Name.	Paid up.	Closing Prices.
10,000	10	7/6	Birm. Railway-Car. & Wagon, L., 1-10,000	10	22 — 23
8,739	10	3/-	Do. Second Issue 1-8,739....	4	8¼— 9¼
10,000	10	6/-	Do. Cum. Pref. 6% 1-10,000..	10	13¾—14¼
30,111	7	7/-	Gloucester Rail.-Car & Wagon, Ld., A, 1-29,861 & 49,751-50,000	7	9⅜— 9⅝
44,889	7	3/6	Do. B, 29,862-49,750, 50,001-75,000	7	4⅛— 4⅜
14,567	10	1/3	Lancashire Wagon, Ord.	2	2⅜ — 2⅝
4,150	10	5%	Do. do.	10	10½—10¾
781,808	1	9d.	Metropolitan Amalgamated Rail.-Carriage & Wagon, Ld., 1-784,808	1	41/--41/6
164,288	1	6d.	Do. Cum. A Pref. 5% 1-164,288	1	23/9--24/3
235,000	1	7½d.	Do. Cum. B Pref. 6% 1-235,000	1	27/6--28/6
20,000	20	20/-	Midland Rail.-Car. & Wagon, Ld., 1-20,000	10	19 —19½

Stocks and Shares marked * are quoted ex-dividend.

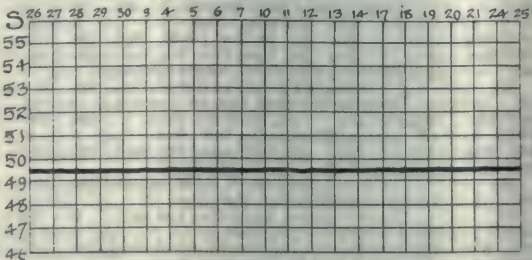
THE HOME METAL MARKET.

SHOWING DAILY FLUCTUATIONS FROM JUNE 26TH TO JULY 25TH, 1905.

COPPER.



PIG IRON: SCOTCH,



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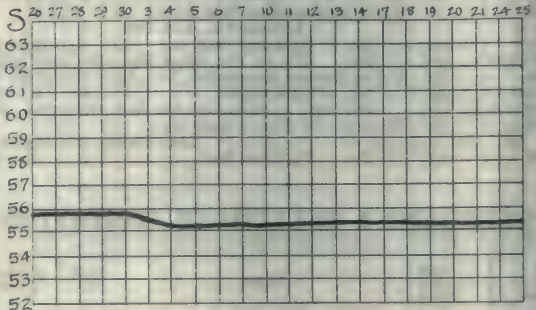

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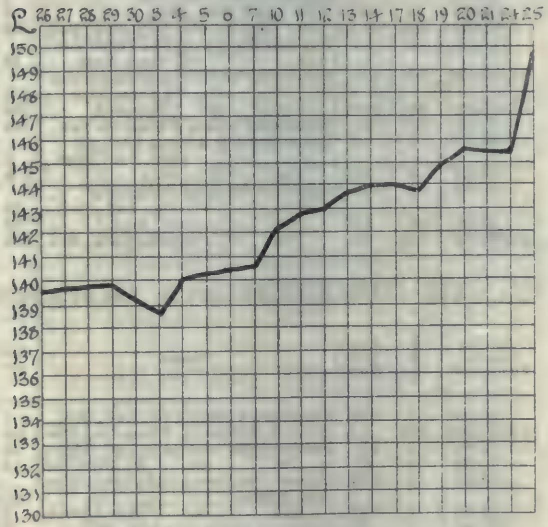
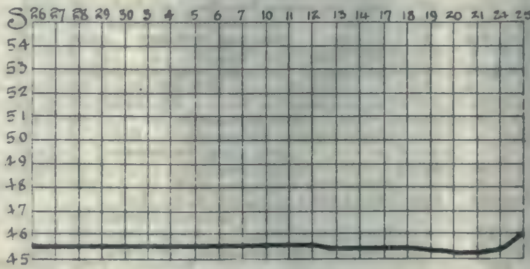
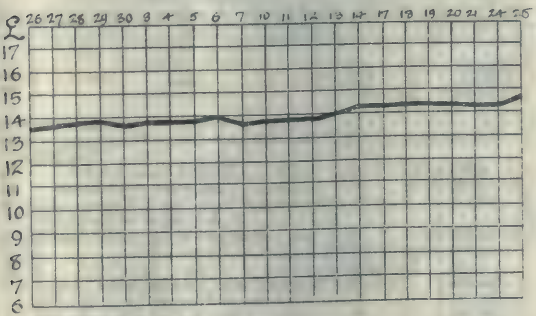


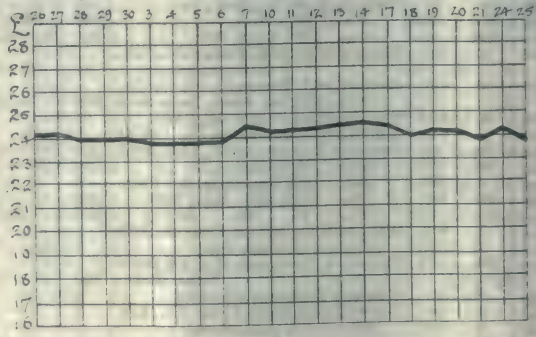
CLEVELAND.



ENGLISH LEAD.



SPELTER.



PRICES CURRENT OF COAL, IRON, STEEL, AND OTHER METALS.

MANUFACTURERS' AND MERCHANTS' QUOTATIONS.

MARKET REPORT.

Wednesday, July 26th, 1905.

THE Copper market has been characterised by great activity. The main feature of recent dealings, as Merton and Co.'s last circular points out, has been buying of Standard copper on behalf of those operators, who some months ago, sold heavily down to £64 in anticipation of lower values, which were then expected by them on the approach of peace in the Far East. These anticipations, it is now recognised, have proved erroneous, but the arguments then put forth induced manufacturers in Europe to restrict purchases to the most urgent requirements. and to allow their stocks to run down to a minimum. The latest tendency shows a falling off in the speculative demand, but values still show an inclination to harden. The closing price is £67 12s. 6d. cash and £68 three months.

Tin has now reached the highest point of the year, cash metal having sold at £149 10s. The news that the sales of Billiton Tin would next year be seriously reduced had a marked effect upon quotations, and with the East firm and a good demand from consumers it is difficult to see how a further advance in prices is to be restrained in face of the scarcity of supplies.

Lead maintains a strong tone, over £14 being readily paid for spot, while August metal is quoted £13 16s. 3d, buyers. There appears to be no relief in sight, and the situation is by no means a satisfactory one for consumers.

A relapse in Spelter has taken place, the short July account having been arranged. Galvanisers and yellow metal makers are, however, full of work, and there is consequently a good inquiry for consumers. Quotations G.O.B. prompt, £24 to £24 2s. 6d. ; Specials nominal.

In the iron and steel section a change for the better has at last arrived in the American situation. After a prolonged period of reserve, consumers have just commenced to negotiate for fresh purchases, and some important quantities of Pig Iron have already been sold at the recently quoted prices. Makers have now raised their demands, and a large business is now in sight. The improvement in America has been reflected in the speculative market here. The closing prices are Cleveland 46s. 9d. cash, 47s. one month. Standard 45s. one month.

IRON, STEEL, PIG-IRON, &c.

SCOTLAND.

Messrs. David Colville and Sons, Ltd., Dalzell Steel and Iron Works, Motherwell, N.B., quote as follows. Prices delivered in Glasgow or equal :—

	Steel:	£	s.	d.
DALZELL	Siemens' Steel Plates, Marine Boiler Quality ..	6	15	0
♛♛	,, ,, ,, Land ,, ,, ...	6	17	6
STEEL	,, Steel Bars, Boiler Quality	6	17	6
DALZELL	Siemens' Steel Plates, Ship Quality Plates......	5	17	6
♛	,, ,, Bars ,, ,, ...	6	7	6
STEEL	,, ,, Angles..........	5	7	6

Manufactured Iron :

	£	s.	d.
Bars—Dalzell..........	6	2	6
,, Best	6	12	6
,, ,, Horseshoe	6	12	6
,, Angle..........	6	2	6
,, Best Angle	6	12	6
,, Best Best	7	2	6
,, Extra Best	7	12	6

Usual terms and extras. Special rates for delivery in England and export . The above prices subject to alteration without notice

The Glasgow Iron and Steel Co., Ltd., Wishaw, quote as under (prices are delivered Glasgow or equal) :—

(Glasgow ♛ Steel)	£	s.	d.	
Steel Angles	5	7	6	per ton.
Steel Ship Plates	5	17	6	,,
Steel Bars, Ship Quality	6	7	6	,,
Glasgow ♛♛ Steel.				
Steel Bars, Boiler Quality	6	17	6	,,
Steel Land Boiler Plates	6	7	6	,,
Steel Marine Boiler Plates	6	7	6	,,

Less 5 per cent. discount. Extras as per standard list.

Special prices for delivery in England and for export. The above prices subject to alteration without notice.

John Spencer (Coatbridge), Ltd., Phœnix Ironworks, Coatbridge, N.B., quote :—

	£	s.	d.
Bars—Phœnix	6	5	0
,, Best	6	15	0
,, Best Best	7	5	0
,, Extra Best..........	7	15	0
,, Best Horse Shoe	6	15	0
,, Extra B.H.S.	7	15	0
,, Extra Best Cable	8	5	0
,, Rivet	6	5	0
,, Best Scrap Rivet	7	5	0

	£	s.	d.
Angles—Phœnix	6	5	0
,, Best	6	15	0
,, Extra Best	7	5	0
Gas Tube Hoops—Phœnix Best	6	15	0
Plates—Phœnix	—		
,, Best Boiler	7	10	0
,, Best Best Boiler	8	0	0
,, Extra Best Boiler	9	0	0
Boiler Tube Strips—Phœnix Best Best	8	0	0

All per ton, delivered f.a.s., Glasgow, Greenock, Grangemouth, Granton, Leith, or Ardrossan. 5 per cent. discount cash monthly.

Messrs. R. Feldtmann and Co., of Glasgow, quote Commission extra).

Pig Iron:	No. 1.			No. 3.		
	£	s.	d.	£	s.	d.
Coltness, f.a.s. Glasgow	3	5	0	2	13	0
Gartsherrie ,,	2	17	0	2	12	0
Summerlee ,,	2	17	0	2	12	0
Carnbroe ,,	2	14	0	2	12	0
Langloan ,,	3	0	0	2	15	0
Calder ,,	2	17	6	—		
Clyde ,,	2	16	6	2	11	6
Glengarnock, f.o.b. Ardrossan	2	17	0	2	12	0
Eglinton ,, ,,	2	12	6	2	10	0
Dalmellington, ,, Ayr	—			2	12	0
Shotts ,, Leith	2	17	6	2	12	6

NORTH OF ENGLAND.

Messrs. W. Whitwell and Co., Ltd., Thornaby Ironworks, Stockton, quote as follows, **at works:—**

	£	s.	d.
W.W. ♔ Bars	6	12	6
W.W. Best Bars	7	2	6
W.W. Best Best	7	12	6
W.W. Best Best Best	8	2	6
W.W. Best Shoe	7	2	6
Thornaby ♔	8	2	6
Thornaby Best	8	12	6
Thornaby Best Best	9	12	6
Whitwell Special Admiralty Cable	10	5	0
Special Chain Iron	9	5	0
Tube and Nail Strips	6	15	0
W.W. ♔ Angle Iron	6	15	0
W.W. Best Angle Iron	7	5	0
Tee Iron, to 8-inches United	7	12	6

Terms, Cash, less 2½ per cent. discount on 10th of month following delivery.

LANCASHIRE.

The Pearson and Knowles Coal and Iron Company, Ltd. Dallam and Bewsey Forges, Warrington, quote :—

		Iron.			Steel.		
		£	s	d.	£	s.	d
♔ (BNF)	Bars	6	10	0	6	15	0
	Angles	7	0	0	7	5	0
	Tees	7	10	0	7	15	0
♔ W.I.W	Hoops	7	0	0	7	10	0
	Sheets	7	10	0	8	0	0

Ordinary Sizes, F.A.S. Liverpool in 10-ton Lots.

Extras for Sizes and Cutting as per List.

WORCESTERSHIRE.

Baldwins Ltd. (with which is amalgamated Knight and Crowther, Ltd.), Wilden Works, near Stourport, quote :—

	Singles 20 G 96in. by 36in. per ton.			Doubles 21 G to 24 G 96in. by 36in. per ton.		
Black Sheets	£	s.	d.	£	s.	d.
"Vale"	10	0	0	10	10	0
"Shield"	10	10	0	11	10	0
"Severn"	11	10	0	12	10	0
"Baldwin Wilden B."	12	10	0	13	10	0
Charcoal	16	10	0	17	10	0
Best Charcoal	18	10	0	19	10	0

Pickled, cold-rolled and close annealed sheets specially quoted for.

Extra widths, Singles to 66in., Doubles to 56in., Lattens to 46in. Extra lengths, Singles to 168in., Doubles to 132in., Lattens to 108in.

Patent Coated Sheets:	£	s.	d.	£	s.	d.
No. 3 Lead	13	10	0	14	10	0
S.V. Lead	15	0	0	16	0	0
No. 3 Terne	15	0	0	16	0	0
S.V. Terne	16	10	0	17	10	0

	Singles 20 G to 108 by 36in. per ton.			Doubles 21 to 24 G to 96 by 36in. per ton.		
Tinned Sheets:	£	s.	d.	£	s.	d.
Best Coke (Finish)	29	0	0	30	10	0
,, Charcoal (Finish)	31	0	0	32	10	0
Extra ,, ,,	33	0	0	34	10	0

Cotton Can Tin Sheets to 39in. by 36in. specially quoted for.

Tin Plates, "Cookley, K" Best Charcoal, £1 7s. 0d. per box.

Extreme sizes in Tin and Patent Coated specially quoted for.

Lattens up to 36 wide by 27 W.G. £1 10s. 0d. per ton extra throughout for all brands.

At works.

Galvanized Corrugated Sheets:

	£	s.	d.	
"Phœnix" Brand, 24 G., f.o.b. London, in Bundles	11	15	0	per ton.
"Blackwall" Brand, 26 G., in felt-lined cases for Australia, f.o.b. London	14	5	0	,,

Galvanized Working Up-Sheets:

	£	s.	d.	
24 G., f.o.b. London, in Bundles	13	0	0	per ton.

STAFFORDSHIRE.

Shelton Iron, Steel, and Coal Co., Ltd., Stoke-on-Trent, North Staffordshire, and 122, Cannon Street, London, quote :—

	£	s.	d.	
Crown Bars	6	10	0	per ton.
Best Bars (1 to 6in. wide, above ¼ in. thick, ½ in. to 4 rounds and squares)	7	0	0	,,
Angles	6	15	0	,,
,, Best	7	5	0	,,
T's	7	0	0	,,
,, Best	7	10	0	,,
Best Shoe Iron	8	0	0	,,
,, Rivet Iron	8	0	0	,,
,, Best Rivet (Special)	9	5	0	,,
,, Cable	9	5	0	,,
,, Screwing	8	5	0	,,

	£	s.	d.	
Best Turning	8	0	0	per ton.
,, Plating	8	5	0	,,
Best Best	9	5	0	,,
Treble Best	10	5	0	,,
Plates	7	10	0	,,
Best Plates	8	0	0	,,
,, Boiler Plates	8	10	0	,,
,, Best Boiler Plates	9	10	0	,,
Treble Best Boiler Plates	12	0	0	,,

Delivery f.o.b. Liverpool, Birkenhead or Manchester.

WALES.

Cordes (Dos Works), Ltd., of Newport, Mon., quote "Star" brand patent wrought nails steel nails, &c.

Discounts—

45 per cent. off 1-inch to 3-inch strong rose and all fine rose and 6dy. and 8dy. pound.

40 per cent. off 3½-inch to 7-inch strong rose and 10dy. and 20dy. pound.

40 per cent. off all sharp-pointed nails.

Delivered in lots of 4 cwt. and upwards. Extra 2½ per cent. discount off the gross on two tons and upwards.

Steel rose, flat points, 5-inch to 7-inch basis:—

2 tons 9/6 per cwt.
4 cwt. lots and upwards 9/9 per cwt. } d/d any Railway Station.

Steel cut nails, 3-inch basis—

2 tons 8/3 per cwt.
4 cwt. lots 8/6 per cwt. } d/d any Railway Station.

Slit rods (iron) £7 10s. per ton, at works for 2-ton lots.

Messrs. Richard Thomas and Co., Ltd., of 33 and 35, Eastcheap, E.C. — Works: South Wales, Burry, Lydney, Lydbrook, and Cwmbwrla, quote:—

	Per Box. f.o.b. Wales. £	s.	d.
Coke Tin-plates.			
C 18¾ by 14 124s. 110 lb. "BV"	0	12	1½
C 20 by 10 225s. 155 ,, "Jumbo"	0	17	3
C 20 by 14 112s. 108 ,, "Lydbrook"	0	11	10½
C 28 by 20 112s. 216 ,, "Lydbrook"	1	4	0
Charcoal Tinplates:			
C 20 by 14 112s. 108 lb. "Allaway"	0	12	7½

BELGIUM.

C. L. Faulkner, Suffolk House, Laurence Pountney Hill, London, E.C., quotes:—

Prices quoted are in £ stg. and per ton of 1,015 kos. (2,240 lb.) delivered free on board ANTWERP for approved quantities.

		£	s.	d	
Steel:					
Blooms	at	3	16	0	per ton.
Billets	at	3	18	0	,,
Sheet Bars	at	4	0	0	,,
Finished Steel:					
Bars	at	4	19	0	per ton.
Angles	at	5	0	0	,,
Tees	at	5	3	0	,,
Joists	at	4	10	0	,,
Fencing Standards	at	5	2	0	,,
Shoeing Bars	at	5	5	0	,,
Tyre Bars	at	5	5	0	,,
Half-Round Bars	at	5	10	0	,,
Heavy Rails	at	5	5	0	,,
Light Rails	at	4	17	6	,,

Structural Steelwork:

Prices on application.

METALS.

Messrs. French and Smith, 147, Leadenhall Street, and 11, Oldhall Street, Liverpool, quote:—

TIN.

Tin:	£	s.	d.		£	s.		
English Ingots, f.o.b. Dis. 1½% & 1%	149	0	0	to	149	10	0	per ton
English Bars, f.o.b. Dis. 1½% & 1%	150	0	0	to	150	10	0	,,
Straits G.M.B., cash Warehouse, Net	149	5	0	to	149	10	0	,,
Straits G.M.B., 3 months, Warehouse, Net	148	10	0	to	148	15	0	,,
Australian, Mt. Bischoff, Warehouse, Net	150	0	0	to	150	10	0	,,

COPPER

Copper:	£	s.	d.		£	s.	d.	
Standard G.M.B., cash Warehouse, Net	67	8	9	to	67	10	0	per ton.
Standard G.M.B., 3 months, Warehouse, Net	67	13	9	to	67	15	0	,,
English, Tough, Cake & Ingot, Warehouses, Net	70	15	0	to	71	5	0	,,
English, Best Select, Warehouse Net	71	15	0	to	72	5	0	,,
English, Sheets and Sheathing, f.o.b., Dis. 2½%	80	0	0	to	81	0	0	,,
English, Sheets for India, f.o.b., Dis. 2½%	76	0	0	to	77	0	0	,,
Electro, Warehouse, Net	71	5	0	to	71	10	0	,,
Ore, ex. ship	0	12	0	to	0	13	0	per unit.
Regulus, Matte and Precipitate, ex ship,	0	13	3	to	0	13	9	,,

YELLOW METAL.

Yellow Metal:	£	s.	d.	
Sheets, 4 by 4 feet for India f.o.b. Dis. 2½%	0	0	6⅝	per lb.
Sheathing ,, ,,	0	0	6½	,,

SPELTER.

	£	s.	d.		£	s.	d.	
Silesian outports, Net	24	0	0	to	24	5	0	per ton.
Blende of 50 % Net	6	13	6	to	6	14	6	,,
Calamine, Net	6	16	0	to	6	17	0	,,

LEAD.

	£	s.	d.		£	s.	d	
English Pig, Warehouse, Dis. 2½%	14	5	0	to	14	7	6	per ton.
Spanish, ex ship, Dis. 2½%	13	17	6	to	14	0	0	,,
Lead Ore of 70 %, Net	7	2	6		7	5	6	

ANTIMONY.

	£	s.	d.		£	s.	d.	
Star Regulus, f.o.b., Dis. 2½ %	60	0	0	to	61	0	0	per ton.
Ore, 50 %, ex ship, Dis. 2½%	15	10	0	to	16	10	0	,,
Crude, ex ship, Dis. 2½ %	35	0	0	to	37	0	0	,,

QUICKSILVER.

	£	s.	d.	
Spanish, 75 lb., Warehouse, Net	7	7	6	per flask
Italian ,, ,, ,,	7	5	6	,,

COAL.

LEICESTERSHIRE.

The Nailstone Colliery Company, Leicester, quote. Price per Ton at Pit of 20 Cwt., with ½ Cwt. per Ton for wastage —

Upper Main Seam.	s.	d.
Main Coal	6	0
Best Hard Steam (hand picked, as used by the Railway Companies)	5	6
Best Hard Steam Cobbles (made through 6 in. mesh, free from slack)	5	6
Fine Slack	0	6

Terms, net cash on 10th of month following delivery.

DERBYSHIRE.

The Manners Colliery Co., Ltd., of Ilkeston quote as follows, per ton at pit:

Kilburn Coal:	s.	d.
Best London Brights	9	9
Large Nuts (1½ to 3¼)	9	6
Small Nuts (¾ to 1½)	6	0
Rough Brights	6	0
Peas (⅜ to ¾)	5	0
Slack	3	6
Smudge	2	0

Low Main (or Tupton) Coal:	s.	d.
Low Main Brights	7	6
,, ,, Nuts	7	3
Hards (Good Steam Coal)	8	0
Bakers' Nuts (1" to 2")	6	6
Slack	3	6

The Clay Cross Company's Collieries, Clay Cross, near Chesterfield, quote:—

	per ton at pit. s.	d.
Best Main Coal	10	6
Best Silkstone	10	0
Best House Coal	8	6
Best House Nuts	8	0
Treble Screened Cobbles	7	9
Best Cobbles	7	3

NOTTINGHAMSHIRE.

The Digby Colliery Co., Ltd., near Nottingham, quote per ton at pit:—

Digby Coal:

Steam.	s.	d.
Best Hand Picked Hard	8	6
Steam Hard	7	3
Hard Nuts	6	6

Gedling Colliery.

High Hazel.		
London Brights, 4 to 8 in. cube	9	6
Bright Cobbles (Hand Picked)	9	0
Large Nuts, 2 to 4 in. cube	8	0
Small Nuts, 1 to 2 in. cube	6	0
Pea Nuts, ⅜ to 1 in. cube	5	0

Steam.—Top Hard.		
Best Hard	8	6
Hard Steam	7	6
Cobbles	6	3

CHEMICALS.

Messrs. S. W. Royse and Co., Albert Square, Manchester, quote:

		£	s.	d.	
Acids:	Oxalic	0	0	2¼	per lb.
	Picric, Crystals	0	0	10	,,
	Tartaric .... at Manchester	0	0	10⅞	,,

		£	s.	d.	
Acetate of Lime:	Brown at Manchester net	8	10	0	per ton
	Grey ,,	11	12	6	,,
Alumina:	Alum, Lump, loose	5	5	0	,,
	,, ,, in casks	5	7	6	,,
	,, Ground, in bags	5	15	0	,,
	Sulphate of Alumina, 14%	4	10	0	,,
Ammonia:	Carbonate	0	0	3⅝	per lb.
	Muriate Grey f.o.b. Liverpool	23	15	0	per ton.
	Sal-ammoniac, Lump, 1sts, del^d. U.K.	42	0	0	,,
	,, ,, 2nds, ,,	40	0	0	,,
	Sulphate .... f.o.b. Liverpool	12	10	0	,,
Arsenic:	Best White Powdered ....net	12	5	0	,,
Bleaching Powder,	35% .... ,,	4	10	0	,,
Borax:	British Refined Crystal......... ,,	12	0	0	,,

Coal Tar Products:				
Benzole, 50/90 % ,,	0	0	6	per gal.
,, 90% ,,	0	0	7	,,
Carbolic Acid Crystals, 34/35° C. ... ,,	0	0	6¼	per lb.
,, ,, ,, 39/40° C. ... ,,	0	0	6½	,,
,, ,, Liquid, 97/99 % ... ,,	0	0	9	per gal.
,, ,, Crude, 62½% at 60° F. f.o.b. ,,	0	1	9	,,
Creosote, ordinary good liquid...... ,,	0	0	1½	,,
Naphtha, Crude, 20 % at 120° C.... ,,	0	0	3	,,
,, Solvent, 90% at 160° C. f.o.b ,,	0	0	8	,,
,, ,, 95 % at 160° C. ,, ,,	0	0	9	,,
,, ,, 90 % at 190° C. ,, ,,	0	0	10	,,
,, Rectified, flash point over 73° F. ....f.o.b. ,,	0	0	11	,,
,, Rectified, flash point over 100° F. ....f.o.b. ,,	0	1	0	,,
Naphthalene, all qualities.				
Pitch...............f.a.s. Manchester. ,,	1	7	6	per ton.

		£	s.	d.	
Copperas:	Green, in bulk .... ,,	0	12	6	,,
	,, barrels f.o.b. L'pool ,,	1	17	6	,,
	Cake ,,	1	2	6	,,
Copper:	Sulphate	20	0	0	,,
Cyanides:	98% minimum ......f.o.b. net	0	0	7½	per lb.
Lead:	Acetate (Sugar) White, English......	27	10	0	per ton.
	,, ,, ,, Foreign c.i.f. U.K	23	5	0	,,
	,, ,, Grey	21	15	0	,,
	,, ,, Brown at Manchester	16	15	0	,,
	Nitrate	24	10	0	,,
	Litharge, Flake	15	10	0	,,
	,, Powder	16	0	0	,,
	Red Lead, Genuine, c.i.f. London less 5%	15	10	0	,,
	White ,, ,, Dry ,, ,, ,,	16	15	0	,,
Naphtha (Wood):	Miscible, 60 o.p.	0	2	6	per gal.
	Solvent..	0	2	7	,,
Potash:	Bichromate... delivered England...	0	0	3	per lb.
	Carbonate, 90/92 % ... c.i.f Hull...	18	5	0	per ton.
	Caustic, 75/80 % ...... ,, ,, ...	20	10	0	,,
	Chlorate ....net	0	0	3$\frac{1}{16}$	per lb.
	Montreal.........in Store, Liverpool	31	10	0	per ton.
	Prussiate, Yellow ....net		0	4⅞	per lb.

	£	s.	d.	
Soda: Ash, Caustic, 48 %, Ordinary .. net	5	5	0	per ton.
,, ,, ,, Refined ,,	6	5	0	,,
,, Carbonated, 48 % ,,	5	10	0	,,
,, ,, 58 % (Ammonia Alkali) net	4	10	0	,,
,, Bleachers' Refined Caustic 50/52 % net	6	10	0	,,
Caustic, White, 77 % ,,	10	12	6	,,
,, ,, 70 % ,,	9	12	6	,,
,, ,, 60 % ,,	8	12	6	,,
,, Cream, 60 % ,,	8	10	0	,,
Crystals, in bags	3	0	0	,,
,, barrels	3	7	6	,,
Acetate c.i.f. Hull net	16	12	6	,,
Bicarbonate, in 1 cwt. kegs	6	15	0	,,
Bichromate......delivered England...	0	0	2¼	per lb.
Chlorate net	0	0	$3\frac{1}{16}$	per lb.
Nitrate...ex quay Liverpool, ... ,,	10	0	0	per ton.
Phosphate	9	5	0	,,
Prussiate net	0	0	3⅝	per lb.
Silicate, Solution, 140° Tw.	4	10	0	per ton.
Sulphate (Glauber Salts)	1	12	6	,,
,, (Saltcake, 95%)	1	15	0	,,
Sulphur: Recovered	4	15	0	,,
Roll	6	15	0	,,
Flowers	7	10	0	,,
Zinc: Sulphate	6	15	0	,,
Shellac: Standard TN orange spot	9	0	0	per cwt.

MINERALS.

Messrs. S. W. Royse and Co., quote:—

	£	s.	d.	
Barytes: Lump Carbonate, 90/92%	3	10	0	per ton.
Sulphate, No. 1, White	2	15	0	,,
China Clay: of various qualities for all purposes; prices from about 11/- to about 30/- per ton, f.o.b. Cornwall: stocks also kept at Runcorn and Preston. Quotations given carriage paid.				
Chrome Ore: Basis 50% c.i.f. British Ports	3	10	0	,,
Manganese: Lump c.i.f. Liverpool 10¼d. per metallic unit.				
Ochre: French JC .... f.o.b. Rouen, net	2	5	0	per ton.
,, JF	5	10	0	,,
Talc: (French Chalk).........c.i.f. Liverpool	3	10	0	,,

Messrs. Henry Bath and Son, quote:—

	£	s.	d.		£	s.	d.	
Copper, Ores of, 10 to 25%	0	12	0	to	0	13	0	per unit.
Regulus, 45 to 55%	0	13	3	to	0	13	9	,,
Precipitate, 65 to 80%	0	13	4½	to	0	13	10½	,,
Tin Ores, 70 %	91	0	0	to	93	0	0	per ton.
Lead Ore, 70%					6	19	0	,,
Blende, 50%					6	9	6	,,
Calamine					6	12	0	
Antimony Ore, 50%	20	0	0	to	22	0	0	,, nom.

Messrs. Barrington and Holt, Cartagena, quote:—

Iron Ore.

			s.	d.	
Ord. 50%,	f.o.b.	Porman	6	4	per ton.
Do.	,,	Cartagena	6	7	,,
Special low phos.	,,	Porman	6	10	,,
Do. do.	,,	Cartagena	7	0	,,
Extra quality do.	,,	,,	7	6	,,
Special Iron Ore	,,	,,	nominal		,,
Specular 58% do.	,,	,,	9	6	,,

TIMBER.

Messrs. Alfred Dobell and Co., Liverpool, quote:—

COLONIAL WOODS.

Timber.

		£	s.	d.		£	s.	d.
Quebec Square White Pine...	per cub. ft.	0	1	9	to	0	3	3
Quebec Waney Board Pine...	,,	0	2	8		0	3	9
St. John Pine, 18 in. average	,,	0	2	4		0	3	3
Lower Ports Pine	,,	0	1	3		0	1	8
Quebec Red Pine	,,	0	1	6		0	2	3
Quebec Oak, 1st quality	,,	0	2	9		0	3	4
Quebec Oak, 2nd quality	,,	0	1	6		0	2	6
Ash	,,	0	1	6		0	2	3
Elm	,,	0	3	3		0	4	0
Hickory	,,	0	2	0		0	2	6
Quebec Birch	,,	0	1	6		0	2	3
St. John Birch	,,	0	1	6		0	2	0
Birch Planks	,,	0	0	9		0	0	11
Spruce Spars	,,	0	0	10		0	1	0

Deals.

		£	s.	d.		£	s.	d.
1st quality Quebec Pine	per std.	22	10	0	to	32	10	0
2nd do. do.	,,	17	0	0		22	0	0
3rd do. do.	,,	11	10	0		13	0	0
St. John, Miramichi, etc., Spruce	,,	7	2	6		7	7	6
Nova Scotia Spruce	,,	7	0	0		7	5	0
Spruce Boards	,,	6	7	6		6	12	6

UNITED STATES, etc., WOODS.

Pitch Pine.

		£	s.	d.		£	s.	d.
Hewn	per cub. ft.	0	1	4	to	0	1	8
Sawn	,,	0	1	0		0	1	6
Planks, Stowage	,,	0	0	10		0	1	0
Boards, Prime	per std.	12	10	0		16	0	0
Oak Timber	per cub. ft.	0	1	6		0	2	6
Oak Planks	,,	0	1	6		0	2	1
East India Teak	per load	12	0	0		16	0	0
Greenheart	,,	6	15	0		7	10	0

EUROPEAN WOODS.

Timber.

		£	s.	d.		£	s.	d.
Riga Redwood	per cub. ft.	0	1	6	to	0	2	0
Dantzic and Memel Fir, Crown	,,	0	2	1		0	2	6
Dantzic and Memel Fir, Middling	,,	0	1	9		0	1	11
Stettin	,,	0	1	9		0	1	11
Swedish	,,	0	1	0		0	1	3
Riga Whitewood	,,	0	1	0		0	1	3
Norway Mining Timber	,,	0	0	9		0	1	0
Dantzic and Stettin, etc., Oak	,,	0	2	6		0	3	0
Norway Spars	,,	0	1	2		0	1	9

Deals.

		£	s.	d.	£	s.	d.
Red Archangel and Onega, 1st quality	per std	19	0	0	20	0	0
Red Archangel and Onega, 2nd quality	,,	14	0	0	16	0	0
Red Archangel and Onega, 3rd quality	,,	10	10	0	12	10	0
St. Petersburg, 1st quality	,,	16	0	0	17	10	0
Do. 2nd ,,	,,	14	0	0	15	0	0
Gefle	,,	11	10	0	16	0	0
Wyburg	,,	11	0	0	12	10	0
Uleaborg	,,	10	0	0	12	10	0
Gothenburg	,,	11	0	0	16	0	0

SELECTED PATENTS.

Compiled expressly for this journal by **Messrs. Page and Rowlingson, Engineering Patent Agents, 28, New Bridge Street, London, E.C.,** and at Manchester.

Copies of Specifications may be obtained at the Patent Office Sale Branch, 25, Southampton Buildings, Chancery Lane, W.C., at the uniform price of 8d.

NEW PATENTS APPLIED FOR.

When Patents have been communicated the names of the communicators are printed in *italics.*

3989A. H. Lentz, London. July 12th.—Improvements relating to valves and valve seats. (Date applied for, February 25th, 1905.)

5195A. A. Mukden, Switzerland. July 13th—A steering gear for boats and ships. (Date applied for, March 13th, 1905.)

14151. T. R. Fowler, Liverpool. July 10th—Improvements in and connected with high-speed, high-pressure, superheated steam engines.

14158. S. Lloyd and A. R. Grossmith, Birmingham. July 10th.—Improvements in and relating to conveying machinery.

14165. E. Turton, Sheffield. July 10th.—Improved internal feed-water heater for steam boilers.

14175. S. E. Haskin, London. July 10th.—Improvements in doors of heating cylinders.

14219. N. R. Smith, London. July 10th.—Improvements in rotary engines.

14299. J. B. Bernhard, London. July 11th—Improvements in Boilers.

14300. J. B. Bernhard, London. July 11th—Improvements in boilers.

14327. E. Moll, Liverpool. July 11th.—Improvements in apparatus for evaporating brine, and at the same time producing high-pressure steam.

14328. O. Petri, London. July 11th.—Improvements in reversible transmission gear.

14336. W. R. Dawe, London. July 11th.—Improvements in valve mechanism for rotary engines.

14341. R. Cosslett, Bristol. July 12th.—Improvements in taps and cocks.

14343. J. E. Meredith, Birmingham. July 12th.—Improvements in spring nut locking washers.

14424. O. Tittlebach, Manchester. July 13th.—Improvements in safety valves.

14425. F. W. Hayward, Norwich. July 13th.—Improved ventilation of submarine vessels.

14426. J. Milne, H. O'Connor, and W. Alexander, Edinburgh. July 13th.—Improvements in valves for reciprocating engines.

14433. T. Lishman and R. J. Rioch, Bristol. July 13th.—Improvements in or connected with steam boilers.

14445. C. P. Altmann, London. July 13th.—Improvements in or relating to steam generators.

14448. G. Quick, Bournemouth. July 13th.—Improvements in screw propellers.

14455. J. McNab and T. P. McNab, Manchester. July 13th.—Variable speed gear for lathes and like machine tools.

14470. J. Keriger, London. July 13th.—Improvements in and relating to valves for furnaces.

14482. H. T. Fenlon, London. July 13th.—Improvements in water-heaters and valves therefrom.

14487. W. J. A. London, London. July 13th.—Improvements in or relating to elastic fluid turbines.

14488. C. W. Paget, London. July 13th.—Improvements in valves for steam and other engines.

14489. W. E. Plummer and W. M. Kermode, London. July 13th.—Improvements in packing for rotating shafts.

14492. A. E. Nicholl, London. July 13th.—Improvements relating to the connection of air and feed pipes and the like to submarine vessels and appliances.

14568. The Warwick Machinery Co., Ltd., and F. Samuelson, London. July 14th.—Improvements in shaft packings.

14569. The Warwick Machinery Co., Ltd., London. July 14th.—Imrovements in and relating to buckets for elastic fluid turbines. (*The General Elec. Co., U.S.A.*)

14638. W. Bothamley, London. July 15th.—Improvements in non-concussion valves or taps.

H. E. Fry, London. July 15th.—Improvements in methods of increasing the efficiency of steam power in the propulsion of ships.

RECENT SPECIFICATIONS.

IMPROVEMENTS IN FLUID-PRESSURE TURBINES.

G. Westinghouse, Pittsburg, U.S.A. June 8th, 1905.—This invention relates to fluid-pressure turbines, and it has for its object to provide a machine of this character, the rotary member of which shall have a vertical shaft, and which, together with the machine or machine member driven thereby, shall be supported by atmospheric pressure that exceeds atmospheric pressure to such degree as may be necessary in order to substantially relieve the shaft bearing from end pressure. It has been a general practice to construct all classes of engines with horizontal shafts, and where such engines have been employed for driving dynamo electric generators, the rotating members of such generators, usually the field magnets, have been mounted directly upon the engine shafts, or coupled either rigidly or flexibly thereto. Turbines having vertical shafts have been employed in certain cases ; but where such construction has been adopted. difficulty has been experienced in supporting the weight of the rotating parts. To eliminate these difficulties, the turbine drum is proposed to be supported by an elastic fluid-pressure in such manner as to avoid the use of a stop bearing, when running, such as has heretofore been considered necessary. In the accompanying drawing, fig. 1 is a vertical section of a fluid-pressure turbine, the dynamo operated thereby being shown mainly in outline.

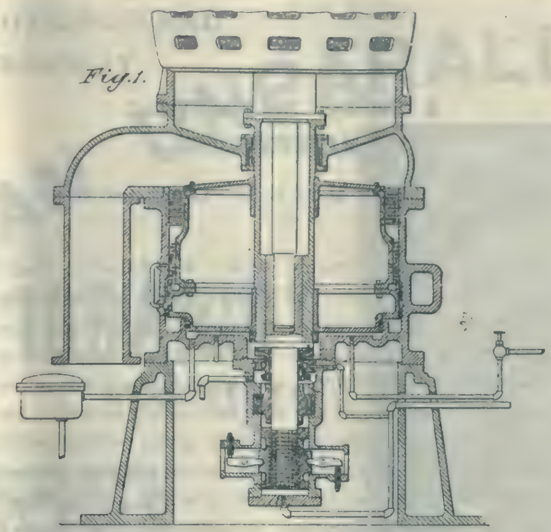


Fig. 1.

In a modification of the invention, the pressure in the balancing chamber is utilised to control a pressure regulating valve, whereby a pressure of propelling fluid is maintained within an auxiliary balancing chamber, and in restricted communication with the first-named balancing chamber, which pressure does not exceed by more than a predetermined amount the variable pressure of supporting fluid within the first balancing chamber.

IMPROVEMEMTS IN EQUILIBRIUM VALVES.

J. Dewrance and G. H. Wall, Southwark. June 15th, 1905.—This invention relates to stop valves, throttle, reducing, surplus, and other valves of the class embodying the equilibrium principal of construction, the primary object being to produce a valve capable of use as a shut-off valve, and in which the pressure to which it is subjected is not merely partially balanced, but in which actual equilibrium is established. A valve constructed according to the improved method, and as illustrated in fig. 1, consists of two disc-shaped heads arranged at a suitable distance apart, and either formed integrally with the valve stem or body, or rigidly attached thereto. Each head is preferably formed or provided with wings which work in seatings and serve as guides. The seatings are maintained at a suitable distance apart by means of arms which constitute a skeleton frame. The heads of the valve are larger in diameter than the bore of the seatings, so that the former take a bearing upon the face of the latter. For enabling a valve of the kind above described to be operated by hand or otherwise, it is attached to a spindle formed with a collar adapted to engage between collars formed upon the valve body, or upon one of the heads, the spindle being engaged with the valve in this manner in order to avoid diminishing the area of the valve-head exposed to the pressure of the fluid to be controlled. For testing the working of the valve whilst in operation, and for clearing any sediment or foreign substance that may become lodged on its working surfaces, a spindle is connected to one end of the valve as shown in fig. 5. This spindle is provided at one extremity with a head adapted to engage a suitably formed projection on the valve, whilst the opposite end of the spindle works in a nut or bridge-piece. A suitable handle is provided for actuating the spindle and imparting an axial movement to the valve. The accompanying drawings illustrate in vertical section an equilibrium valve constructed according to this invention. Fig. 5 illustrates means for operating the valve from the exterior.

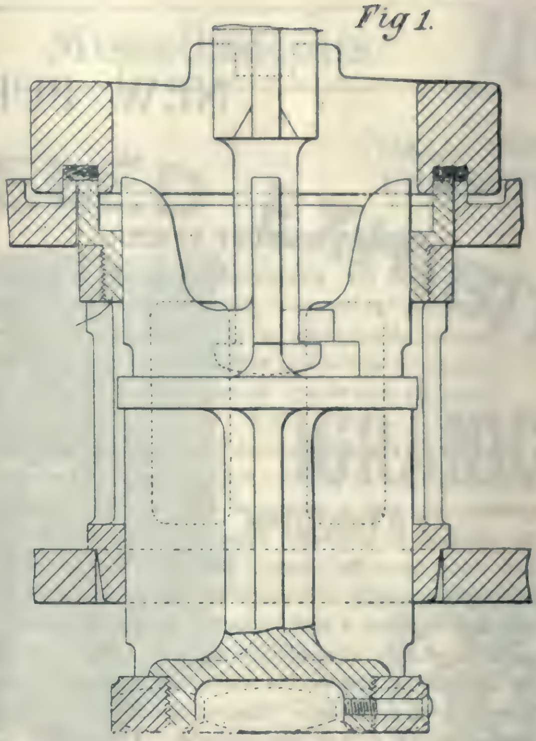


Fig 1.

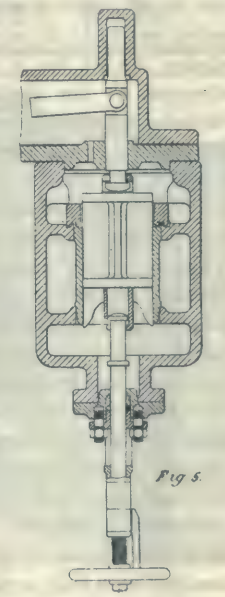


Fig 5.

NEW PUBLICATIONS.

"MODERN FOUNDRY PRACTICE."

Dealing with the green-sand, dry-sand and loam moulding processes; the materials used; also detailed descriptions of the machinery and other appliances employed, with practical examples and rules. By John Sharp. Second Edition. E. and F. N. Spon. 21s. net.

The art of founding spreads itself over such a widely diversified field of practice that to attempt to deal comprehensively with a subject of such dimensions within the compass of a volume, even of this size, would be a task futile from the outset. But Mr. Sharp has an intimate knowledge of his topic and he has succeeded in bringing together a vast amount of reliable information on every subject of essential importance to the founder. He informs us that he has embodied in this work the best part of Spretson's "Casting and Foundry" (the issue of which is now discontinued). This matter has been carefully revised and reconstructed in order to make it correspond with the general character of "Modern Foundry Practice." The various subjects are introduced to the reader concisely and in a progressive order. In foundry practice, as in other spheres of engineering industry, the art has of recent years been considerably advanced by the application of natural science and the founder is now able to solve many of the more difficult and abstract problems which occur during the various operations. In this volume the chemical reactions and the hydrostatic and mechanical principles involved in foundry practice are described with lucidity and accuracy. Although great attention is devoted to theoretical knowledge, the author rightly insists upon the necessity of a thorough practical experience. Cupola management and the subject of cupolas generally are discussed in detail, reference being made to the characteristic changes in the quality of cast-iron as the direct result of re-melting, also the relations at present existing between the quantity of coke consumed under the most favourable actual conditions and the quantity of fuel shown to be necessary by theoretical considerations. The composition and properties of the materials used in the foundry are dealt with from a practical standpoint, in addition to many theoretical observations which will be found of considerable value. The work is profusely illustrated and a series of admirable folding diagrams further enhance the utility of this authoritative work.

"A COURSE IN PRACTICAL MATHEMATICS."

By F. M. Saxelby, M.Sc. B.A. Longmans, Green and Co. 6s. 6d.

The study of geometry, writes Mr. Saxelby, should begin with a course of experimental measurement. The object of the treatment followed in this book is to extend the same method to some other branches of mathematics with special reference to the needs of the technical student. In the chapters on trigonometry, for instance, while results are nowhere given without proof, the deductive treatment is, as far as possible, accompanied at every step by graphic or arithmetical verification, to enable the student to realise clearly his own experience of space and to see that he is not dealing with an arbitrary system of symbols alone. The study of definite integration is preceded by a chapter in which various practical problems on integration are treated entirely by graphic and intentional methods, so as to stimulate the interest of the student and to lead him to feel the necessity for analytical methods of integration. The fundamental laws of vector algebra are each given in connection with some application to mechanics or geometry, while the chapters on solid co-ordinate geometry deal with some parts of the subject which bear on the student's study of practical solid geometry. The author has spared himself no pains in order to ensure the completeness of this rather elaborate treatise.

Charles Winn and Co., Engineers, Birmingham. A well designed show card just issued calls attention to the firms "Reliable Boiler Mountings" the type being embossed in white on a green ground, while two white sunken panels throw into high relief some excellent half-tone representations of the firm's valves. The eye having been thus attracted can scarcely fail to note the adjacent legend which runs as follows: Stop valves in iron and steel, Safety valves, Feed valves, Blow-off valves, Water gauges, Pressure gauges, Gauge glass protectors. The card is substantially produced and has an artistic bevel. A maroon silk cord is attached and doubtless will be used in many offices and works for hanging this engineering picture "on the line."

PAGE'S WEEKLY Miscellaneous

AGRICULTURAL HALL, 1905.
TRAMWAY EXHIBITION.

AN UNPARALLELED EXHIBIT.

"IGRANIC"
RHEOSTATS.

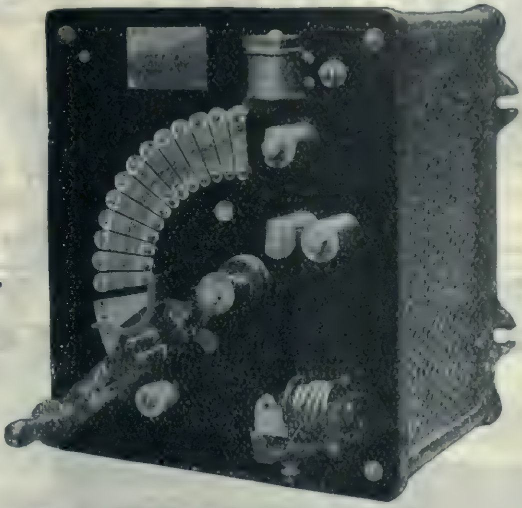


FIG. 2.—RENEWABLE CONTACT TYPE.
Used from 55 amperes upwards.

"IGRANIC"
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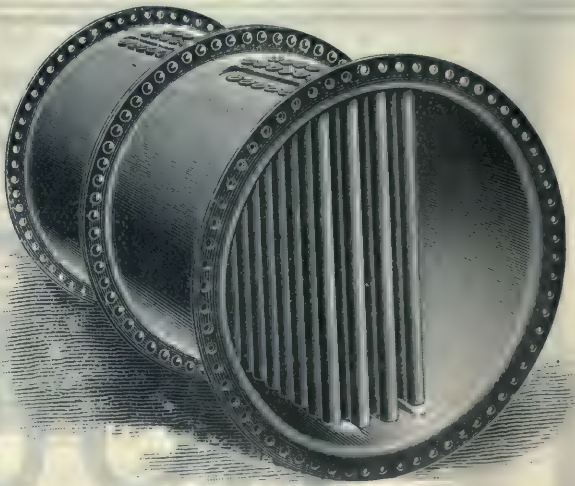
STURTEVANT ENGINEERING CO., LTD.,
147, Queen Victoria Street, E.C.

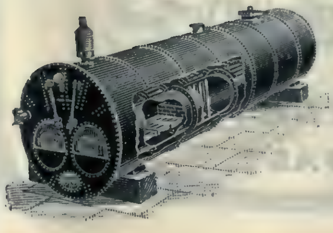
To Steam Users.

Economy in your Fuel account guaranteed by using Premier Boiler Tubes. These Tubes can be fitted to any Lancashire Boiler, and will **INCREASE** the evaporative efficiency

20 per Cent.



Part view of Flue fitted with PREMIER TUBES.



For Particulars apply to the Secretary—

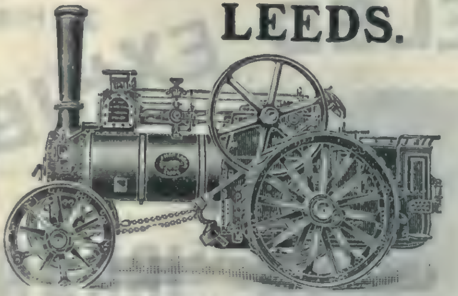
The Premier Boiler Tubes, Ltd.,
28, VICTORIA STREET,
LONDON, S.W.

Telephone No: 1638 VICTORIA.
Telegrams: "TUBULE, LONDON."

PAGE'S WEEKLY Locomotives, &c.

McLAREN'S Traction Engines, **LEEDS.**

Cable Address: "McLAREN, LEEDS."
Codes used: A B C 4th and 5th Editions. LIEBER'S.

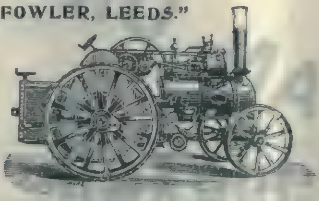


Catalogues and Pamphlets mailed free on application to—
J. & H. McLAREN, Midland Engine Works, LEEDS.

JOHN FOWLER & CO. (Leeds), Ltd.
Steam Plough Works, LEEDS.

Telegrams: "FOWLER, LEEDS."

Manufacturers of
Traction Engines,



Steam Rollers, Portable Railways, &c., &c.

BALDWIN LOCOMOTIVE WORKS.

BROAD AND NARROW GAUGE **Locomotives** SINGLE EXPANSION & COMPOUND

Mine, Furnace and Industrial Locomotives.

Electric Locomotives with Westinghouse Motors and Electric Trucks.

Burnham, Williams & Co., Philadelphia, Pa., U.S.A.
Cable Addresses: "Baldwin, Philadelphia"; "Sanders, London." General Agents: SANDERS & CO., 110, Cannon St., London, E.C.

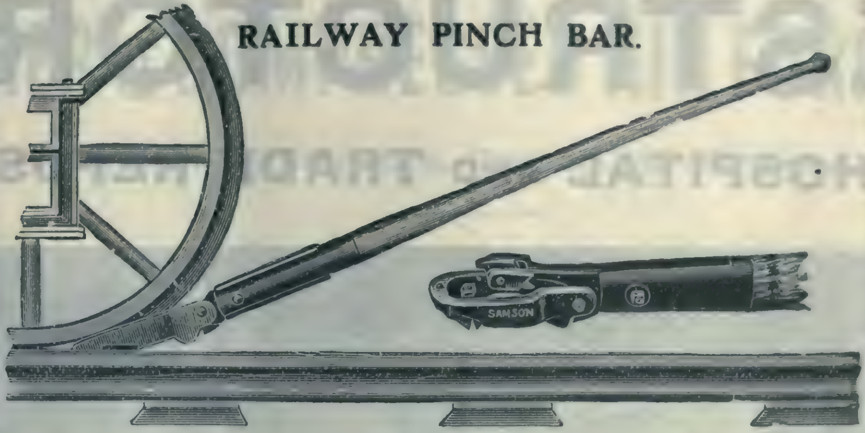
More durable than iron. Cheapest for all spans up to 100 Feet.

D. ANDERSON & SON, Ltd.,
LAGAN FELT WORKS,
BELFAST.

PAGE'S WEEKLY Railway Pinch Bars

The "SAMSON."

RAILWAY PINCH BAR.



A Few of the Users of the "Samson" Pinch Bars:—

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Cork, Bandon & South Coast Railway Co.
Donegal Railway Co.
Great Northern Railway Co.
Great Southern and Western Railway Co.
London and North Western Railway Co.
Midland Railway Co.
Midland Railway Co., N.C. Committee.
Bolckow Vaughan & Co.'s Collieries.
Grassmoor Collieries.
Garforth Collieries.
Henry Briggs, Son & Co., Ltd.
Hoyland Silkstone Collieries.
Houghton Main Collieries.
J. & G. Wells' Eckington Collieries.
Micklefield Coal and Lime Co.
Mitchell Main Collieries.
Shireoaks Collieries.
Sheepbridge Co, Iron and Steel Works
Staveley Iron and Coal Co.

The "Samson" Pinch Bar

Is used as a great labour-saving tool where wagons or locomotives require moving short distances.

OUR OFFER:—

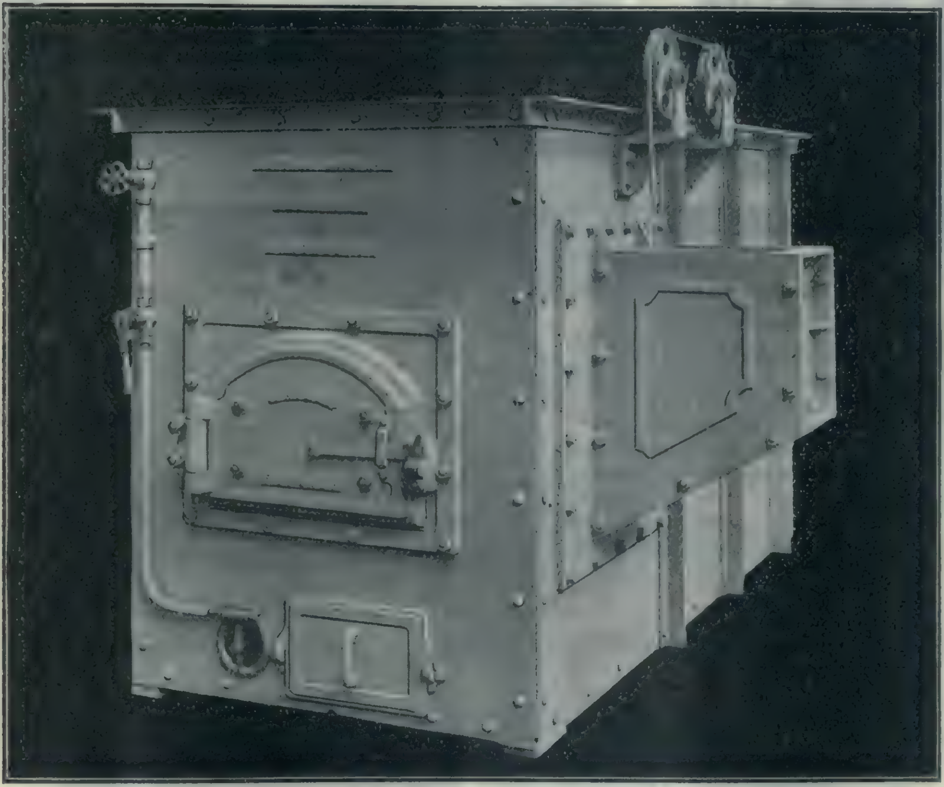
SPECIMEN BAR SENT ON SEVEN DAYS' FREE TRIAL CARRIAGE PAID BOTH WAYS.

SAMSON & CO.,

Garforth, near LEEDS.

MELDRUM DESTRUCTORS

FOR HOSPITAL AND TRADE REFUSE.



Meldrums' Patent High Temperature Refuse Destructor (Industrial Type) for Trade Refuse.

As supplied to the Metropolitan Asylums Board, Lancaster Asylum, Wholesale Co-operative Society, &c., &c.

WRITE FOR FULL PARTICULARS TO

MELDRUM BROS., LTD.,
TIMPERLEY, MANCHESTER.

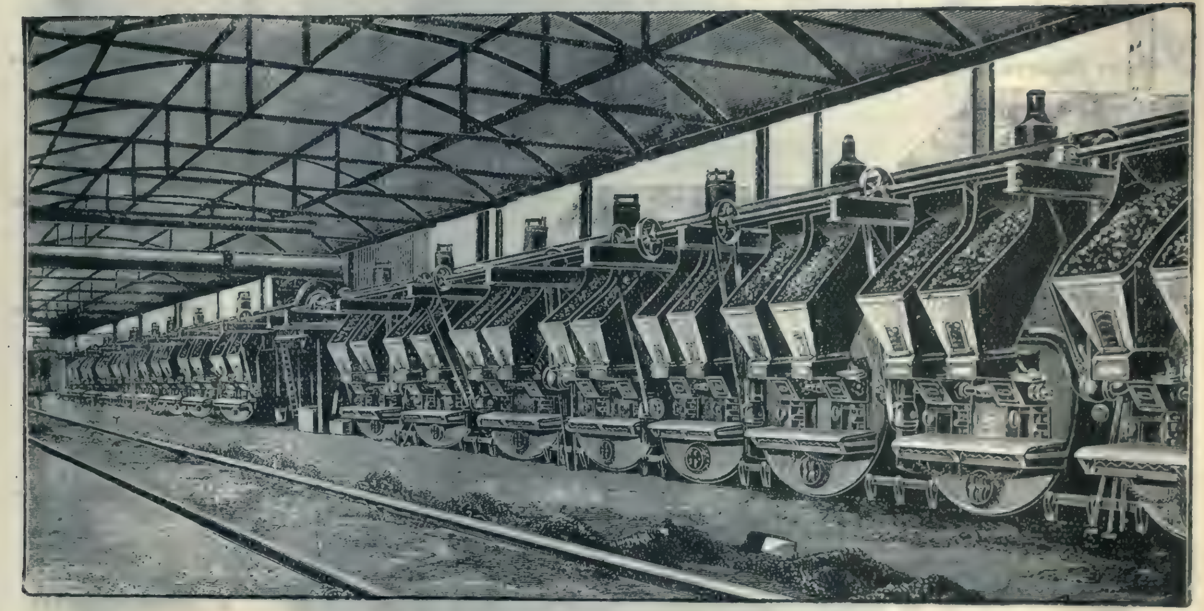
And 66, Victoria Street, WESTMINSTER.

BENNIS

STOKER & COMPRESSED AIR FURNACES

Suitable for either Lancashire, Cornish, or Water-tube Boilers.

THOUSANDS IN USE.



Photograph of Boilers which have been working night and day since 1899.

Write for descriptive Booklet—

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Little Hulton Iron Works,
BOLTON.

HUNT & MITTON'S

IMPROVED BATH SUPPLY VALVES

Suitable for Public Baths, Asylums, or Institutions.

CHIEF FEATURE.—Only one handle to operate.

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Improved Waste Valve and Shower Bath Valve.

Water Heaters, Injectors, Ejectors, &c.

Revolving Water Sparger and Shower Bath.

Laundry Fittings.

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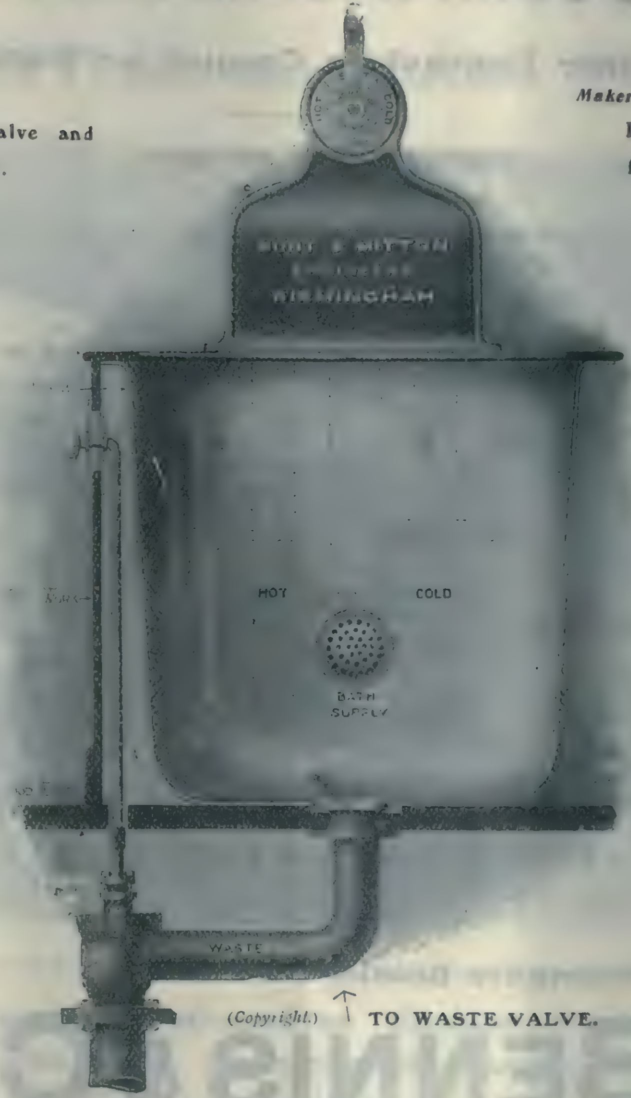

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Makers of . .

Lubricators, Oil Pumps, Oil Boxes, Grease Cups, &c.

Instantaneous Hose Couplings.

Hydrants.

Copper Branch Pipe and Stand Pipes.

Complete Fire Equipments.

Landing Valves, Sluice Valves, Scaling Hooks, Scaling Ladders, &c., &c.

HUNT & MITTON, ENGINEERS, BRASSFOUNDERS, &c.,

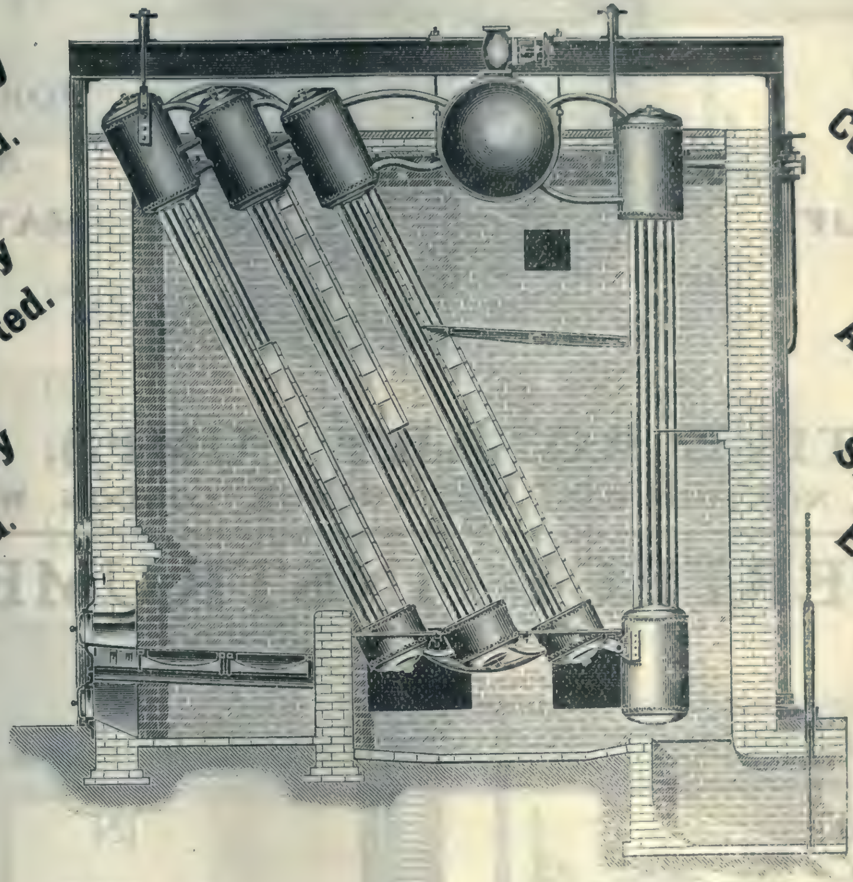
Crown Brass Works, Oozells Street North,

Birmingham.

Telephone No.: 394.
Telegraphic Address: "MITTON, BIRMINGHAM."

RICHARDSONS, WESTGARTH'S

"NESDRUM" WATERTUBE BOILER.



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Simple, Safe, Economical.

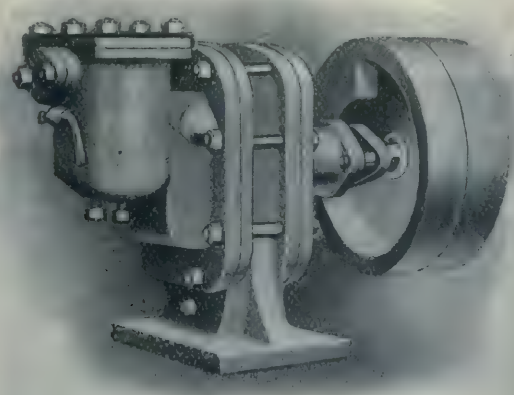
MADE IN ALL SIZES TO EVAPORATE 3,000 TO 50,000 LBS. OF WATER PER HOUR.

RICHARDSONS, WESTGARTH, & CO., Ltd.,

HARTLEPOOL.

The Best Industrial Pump in the World

FOR ANY DRIVE.



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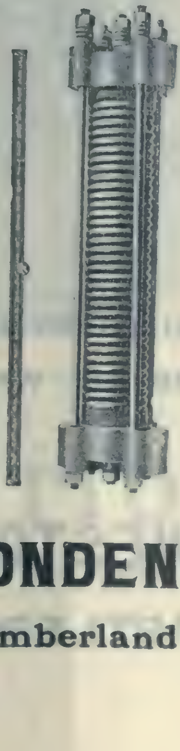
ANY
LIFT.

FOR
ANY
MATERIAL.

POSITIVE ROTARY PUMPS, LTD.,
23, NORTHUMBERLAND AVENUE, LONDON, W.C.

A PERFECT INSTRUMENT.



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SIMPLEST
CONDENSER

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WORLD.

CONCENTRIC CONDENSER, LTD.,
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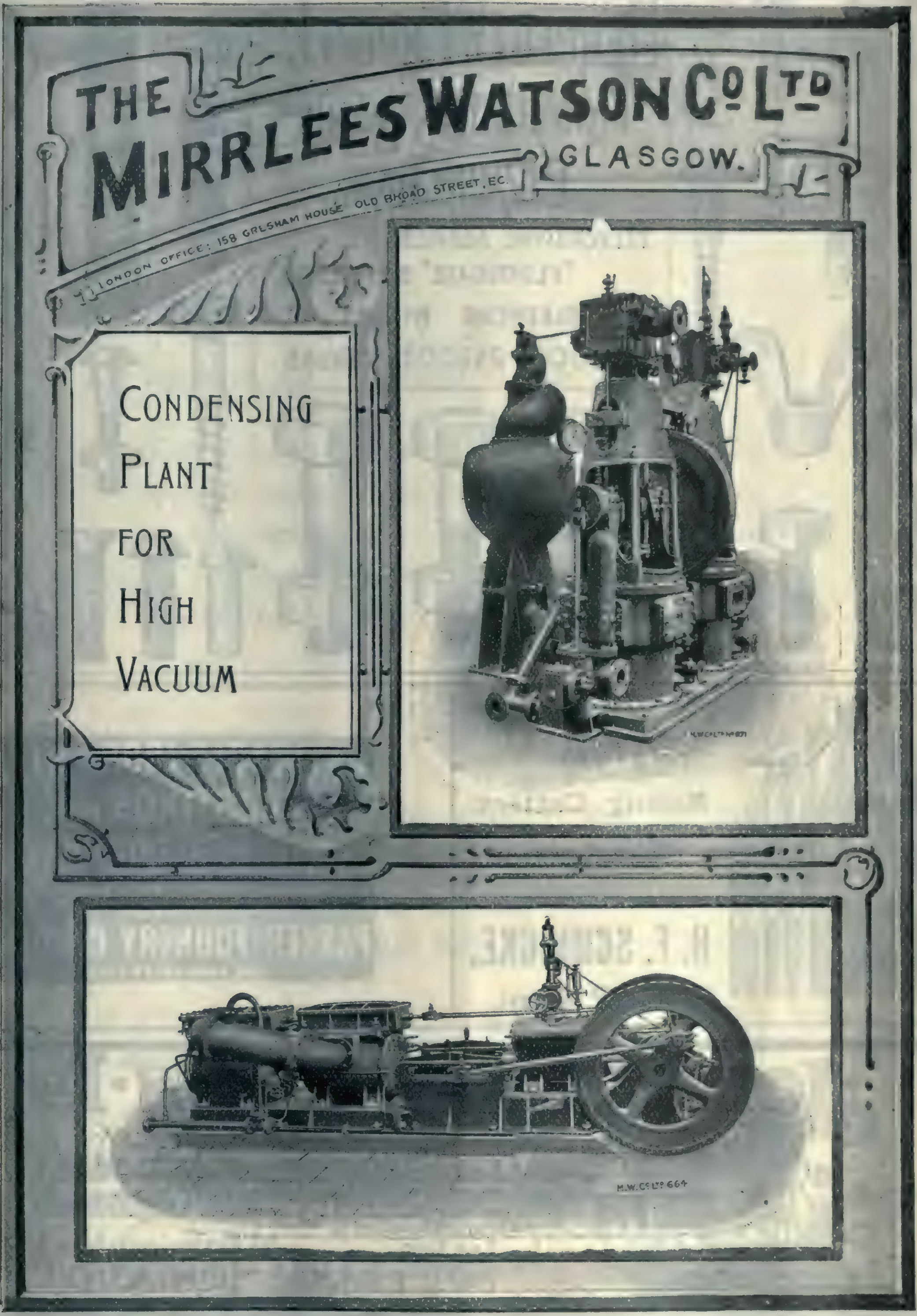

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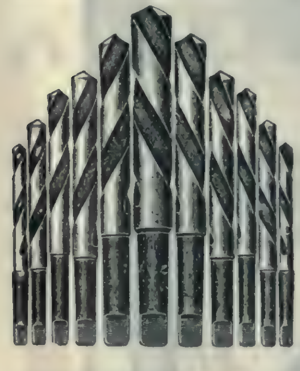

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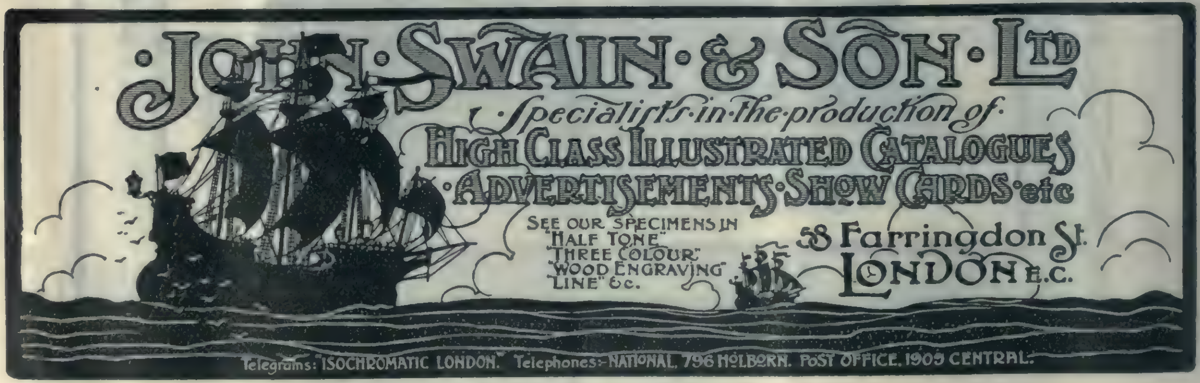

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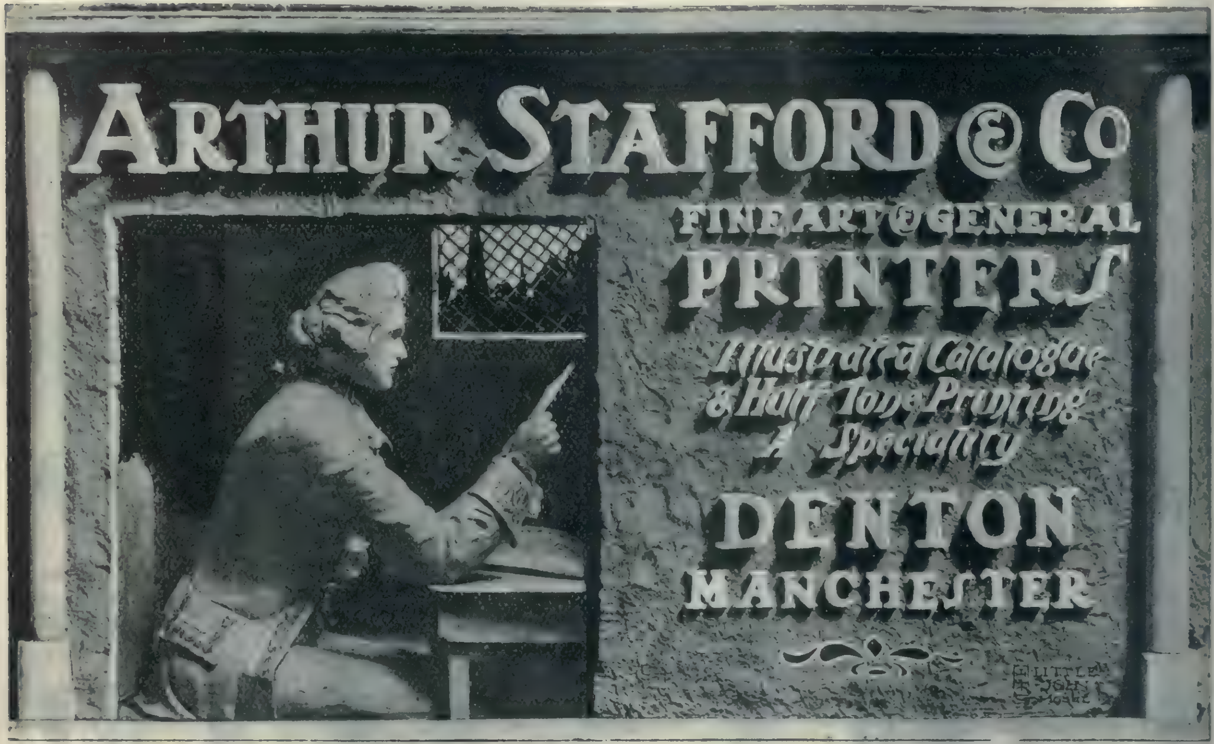

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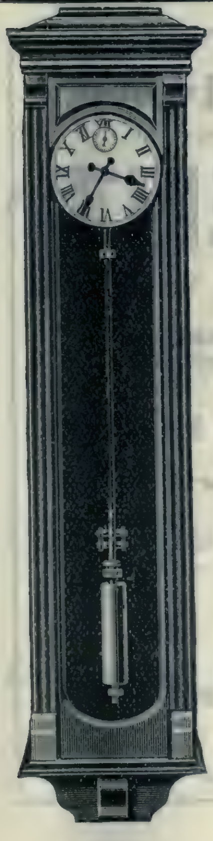

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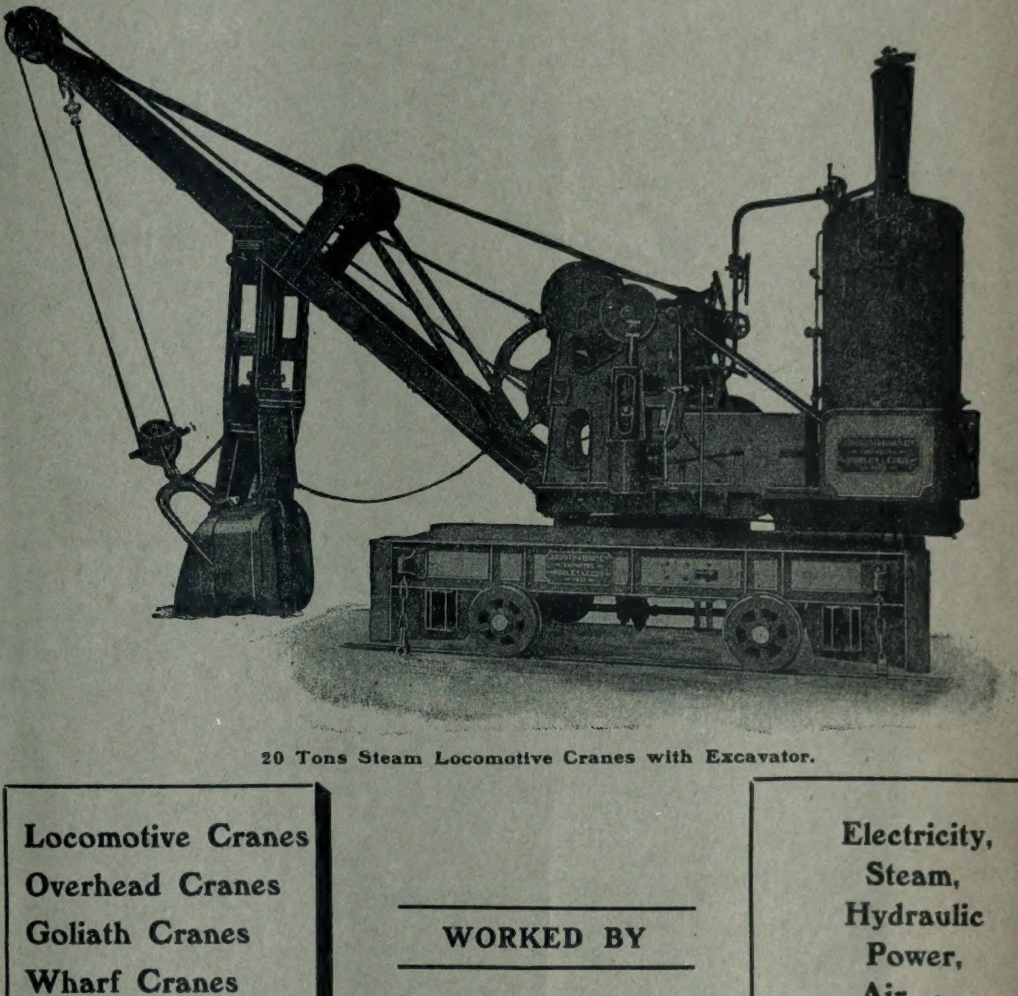

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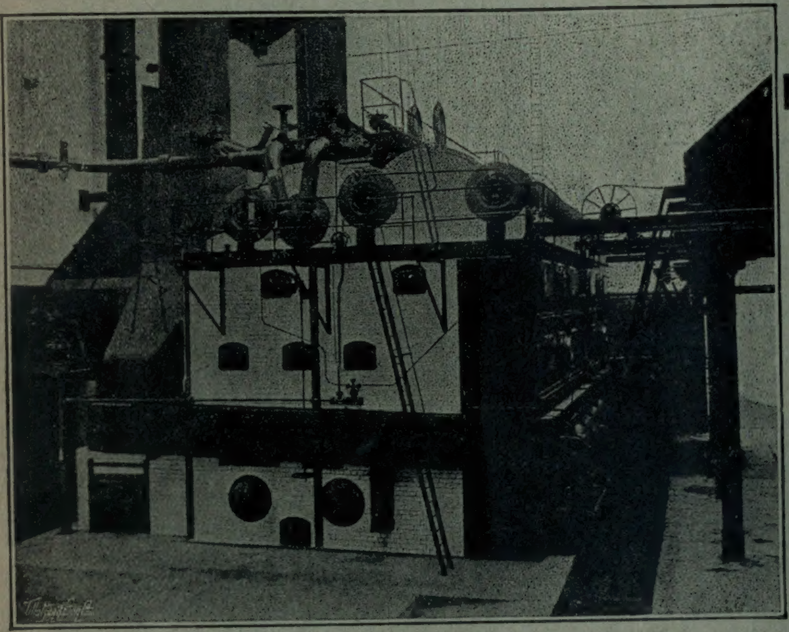

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